THESIS/
REPORT
AHERN, R.

Coronado National Forest monitoring and evaluation report
Trend analysis: 1986 to 2010

Richard Ahern

Coronado National Forest Monitoring and Evaluation Report

Trends Analysis: 1986 to 2010

Certification

The Land and Resource Management Plan (Forest Plan) for the Coronado National Forest (Coronado NF) was approved August 4th, 1986. Since that date there have been twelve amendments and three change notices.

I have reviewed this Monitoring and Evaluation Trend Analysis for the Forest Plan, noting that it is one in a suite of documents that underlie a determination that the Forest Plan is ripe for revision in compliance with the National Forest Management Act and its implementing regulations. The Coronado NF is currently revising its Forest Plan, encouraging public participation and complying with the National Environmental Policy Act.

I have reviewed the recommendations for change documented in this report and have assigned appropriate Forest staff to address identified issues and recommendations during development of the revised Forest Plan.

JIM UPCHURCH
Forest Supervisor

7/29/11
DATE

TABLE OF CONTENTS

LIST OF PREPARERS **5**
INTRODUCTION **6**
RECREATION AND VISUAL QUALITY **7**
ISSUE 1 7
ISSUE 2 9
ISSUE 3 11
ISSUE 4 12
ISSUE 5 12
ISSUE 6 13
NEW ISSUES 13
WILDERNESS **14**
ISSUE 1 14
ISSUE 2 15
NEW ISSUES 16
CULTURAL RESOURCES **17**
ISSUE 17
NEW ISSUES 18
WILDLIFE AND FISH **20**
ISSUE 1 20
ISSUE 2 23
ISSUE 3 24
ISSUE 4 25
ISSUE 5 25
NEW ISSUES 26
RANGE **27**
ISSUE 1 27
ISSUE 2 28
NEW ISSUES 28
TIMBER AND FOREST PRODUCTS **29**
ISSUE 1 29
ISSUE 2 29
ISSUE 3 30
NEW ISSUES 31
PLANT AND ANIMAL DIVERSITY **32**
ISSUE 1 32
ISSUE 2 32
ISSUE 3 32
NEW ISSUES 33
SOIL AND WATER **34**
ISSUE 34
NEW ISSUES 34
MINERALS **35**
ISSUE 35
NEW ISSUES 36
LANDS AND SPECIAL USES **37**
ISSUE 1 37

ISSUE 2 37
ISSUE 3 38
NEW ISSUES 38
SPECIAL AREA DESIGNATIONS 39
ISSUE 1 39
ISSUE 2 40
NEW ISSUES 40
PROTECTION 41
ISSUE 1 41
ISSUE 2 42
NEW ISSUES 42
FACILITIES (ROADS AND TRAILS) 44
ISSUE 1 44
ISSUE 2 45
ISSUE 3 47
ISSUE 4 47
NEW ISSUES 48
LAW ENFORCEMENT 49
ISSUE 49
NEW ISSUES 49
FOREST PLAN MANAGEMENT DIRECTION 50
NEW ISSUES 50
OUTPUTS 51
NEW ISSUES 51
INSECT AND DISEASE MANAGEMENT 52
NEW ISSUES 53
LITERATURE CITED 55
APPENDIX: MANAGEMENT INDICATOR SPECIES STATUS REPORT 2011 57

List of preparers

Richard Ahern - Mineral and Geology Program Manager

Duane Bennett - Zone Lands and Special Uses Staff

Sharon Biedenbender - Invasive Species Coordinator

Cheri Bowen - Law Enforcement Officer

Eli Curiel - Civil Engineer

Walt Keyes - Roads Engineer

Tami Emmett - Public Access Specialist

Rick Gerhart - Wildlife, Fish, and Rare Plants Program Manager

William Gillespie - Forest Archaeologist

Ed Holloway - Range Program Manager

Larry Jones - Assistant Wildlife Program Manager

Walt Keyes - Roads Engineer

Debby Kriegel - Landscape Architect

Connie Lane - Recreation, Lands and Special Uses Program Manager

Robert Lefevre - Soils, Water, Air, and Forestry Program Manager

Ann Lynch - Entomologist, Rocky Mountain Research Station

Linda Peery - Planning Biologist

Jennifer Ruyle - Forest Planner

Jeremy Sautter – Lands Trainee

Chris Stetson - Fire and Fuels Specialist

Craig Wilcox - Forest Silviculturist

Introduction

The Coronado National Forest (Coronado NF or Forest) Land and Resource Management Plan (Forest Plan) was approved in 1986. Since then, periodic reviews of the implementation and effectiveness of the Forest Plan have been conducted and documented in monitoring and evaluation reports. The "1986 to 2010 Monitoring and Evaluation Report Trend Analysis" represents a comprehensive look at all of the Forest Plan monitoring information that has been collected to date, along with an analysis of trends represented by that information. Management implications of trends are discussed, and recommendations for changes in management direction are made. The analysis is organized around the original issues, concerns, and management opportunities identified in the Forest Plan (USFS 1986, pp. 3 – 6), although several focal areas (such as insects and disease) were not included in the current plan and have been added to identify future management needs and opportunities. This analysis is part of the information base used to inform revision of the Forest Plan.

Recreation and Visual Quality

Coronado Forest Plan Recreation and Visual Quality Issues

1. Identification of potential overuse areas and establishment of carrying capacities (number of people who can use an area without damage to natural resources
2. Regulation of off-road vehicle use to protect other Forest resources and uses, while continuing to provide this much-demanded recreational opportunity.
3. Use of land for recreational development and dispersed uses, and establishment of equitable fees for recreational use
4. The role of the private sector in providing recreation services on and adjacent to the national forest must be reassessed
5. Inventory and management planning for the Coronado's many caves and location of this resource to recreational, scientific, and Wilderness uses
6. Visual resource integrity in all land management decisions

Issue 1: Identification of potential overuse areas and establishment of carrying capacities (number of people who can use an area without damage to natural resources)

This is still a valid issue for management of the Coronado National Forest. The population of southeastern Arizona and southwestern New Mexico continues to grow, resulting in many recreation areas on the Coronado reaching or exceeding recreation capacity on a regular basis. This is a complex problem that will not be easy to resolve and is expected to continue to escalate for the foreseeable future.

The 1992 and 1999 evaluations do not supply sufficient information for a trend analysis. Recreation concept plans partially addressed carrying capacity for some areas, but plans for many other areas were never completed.

Although it is fairly simple to determine a recreation carrying capacity for developed recreation sites based on number of parking spaces or campsites, determination of a carrying capacity for the remainder of the Coronado (especially dispersed sites), and determining a carrying capacity that does not substantially impact natural resources is more challenging.

Issue 1 uses the phrase "potential overuse areas," yet what is more readily identifiable are "existing overuse areas" and, once such are acknowledged, management tends to react as needed to the specific situation. Over the past 25 years, this management style has been exercised in many locations across the Coronado.

Some concept plans need to be revisited and updated. The Sabino Canyon Recreation Concept Plan is currently being revised. Plans are needed for high recreation use areas currently lacking them. Capacity studies would be helpful for areas of high use dispersed, permitted, and developed recreation.

The 1999 evaluation suggests maintaining a log (or register) for hang-gliding and rock-climbing. In the case of rock climbing, none has been maintained. In the case of hang-

gliding, none is needed because this sport now uses a permit system and gated road to control use. In the future, the hang-gliding permit count should provide a reasonable substitute system. As the variety of recreational activities on the Coronado National Forest increases, so does the potential for damage to resources and conflicts between users. A recent example is the recreational use of ultralight aircraft in Cave Creek Canyon, and the resulting conflict with those desiring a quiet experience. This issue was raised in the Forest Plan revision process; however, jurisdiction for all aircraft lies with the Federal Aviation Administration.

National Visitor Use Monitoring

Successfully identifying overuse areas and determining carrying capacities relies on an understanding of visitor use trends on the landscape. While the Forest has never commanded the resources necessary to conduct broad-scale visitor use surveys, the National Visitor Use Monitoring (NVUM) Project[1] supplies valuable information to recreation managers, offering analysis at the forest- and national-levels for a number of visitor use characteristics. The most recent Forest-specific results were published in October of 2008 (USDA Forest Service 2008), based on samples taken in FY2001 and FY2007; national results were recently updated in April of 2010 (USDA Forest Service 2010).

The NVUM project requires at least four "data points" from the same location to conduct a trend analysis; at the time of this evaluation, only 2 rounds (or sets of data from the same point) have been collected for each Forest. So, while trends cannot yet be assessed, relative differences can be compared between the collection years (FY2001 and FY2007). The following paragraphs summarize these changes with respect to estimates of visitor use from the 2008 report, including site and forest visits, activity participation, facility visits, spending, and visitor satisfaction.

The total number of estimated site visits, including those to designated Wilderness areas, decreased by one percent during the period, while total estimated National Forest visits increased by 6.7 percent, reflecting the moderate decrease in average number of sites visited per National Forest visit. In FY2001, 18.3 percent of those total estimated site visits were to designated Wilderness areas; similarly, 17.1 percent were to designated Wilderness areas in FY2007. For both sample periods, more than 60 percent of Wilderness visitors were male. Length of stay did not appreciably change for any visit type.

The number of Coronado NF visitors participating in developed camping, fishing, picnicking, historic site viewing, relaxing, and driving for pleasure increased modestly between FY2001 and FY2007; also, wildlife viewing and hiking/walking saw large increases in participation. In contrast, participants in primitive camping, backpacking, hunting, horseback riding, and snow-based activities decreased over the same period. Visitors used scenic byways, museums, and interpretive displays more in FY2007, but used forest roads less. While changes in activity and facilities usage could have management implications, the NVUM report cautions against interpreting these as significant changes, since certain aspects of the sampling methodology were modified between the first and second round of data collection on the Forest.

[1] For more information, visit: http://www.fs.fed.us/recreation/programs/nvum/

As might be anticipated, "local" visitors to the Coronado NF outnumbered "non-local" visitors for both sample sets at a ratio of about 4:1; of the local visitors, day visits comprised over 60 percent of total visits in both FY2001 and FY2007, while day visits made up only 7 percent of all Forest visits for the non-local visitor category. Spending information was not collected in FY2001. However, the FY2007 sample reports average total trip spending per visiting party at $517.00, with median total trip spending at only $50.00.

The NVUM report also offers a wealth of satisfaction information, only some of which is summarized here. Overall, 83 percent of Forest visits received the highest satisfaction rating in FY2007; another 14 percent received a Somewhat Satisfied rating (overall satisfaction was not analyzed in FY2001). Between the sample periods, improvements were made in the percent of visitors whose expectations were being met for Developed Facilities and Services across the Forest, and for Access and Perception of Safety in Undeveloped Forest areas only. Visitors overwhelmingly expressed elevated Importance-Performance ratings in FY2007 for categories such as restroom cleanliness, developed facility condition, and road condition for all non-Wilderness Forest areas. In general, the NVUM report suggests that the Coronado NF is delivering a satisfactory outdoor recreation program to its visitors.

Need for Change Recommendation

This is an issue that will continue to exist on the Coronado National Forest. Forest managers will continually need to be aware of overused areas and resource damage and act as needed to resolve problems. The need remains to plan for and carry out capacity studies on high use areas, especially those used by the public and permittees.

Issue 2: Regulation of off-road vehicle use to protect other Forest resources and uses, while continuing to provide this much-demanded recreational opportunity

Off-highway vehicle use across the States of Arizona and New Mexico, as well as nationally, has more than tripled in the last 20 years, based on the sales of all-terrain vehicles and dirt bikes. In the 1986 Forest Plan, off-highway vehicle use was restricted to designated roads or in some areas to trails designated for motorized use.

In 1994, a decision was made to implement the *Santa Rita Off-Highway Vehicle Development Projects* to provide quality recreation experiences that accommodate off-highway vehicle users. This decision allowed the Coronado National Forest to develop an information system for off-highway vehicle users (brochures and information boards with maps) so users would be directed to roads that are appropriate and legal for off-highway vehicle traffic (one location also allowed for off-highway vehicle loading ramps). This process also located and designated readily visible "information areas" to provide off-highway vehicle users information about riding opportunities that would result in the least amount of impacts to Forest resources. The information areas are located near major intersections so as to minimize impacts to nearby private lands. Implementation of this decision, when Forest Protection Officer compliance positions are in place and funded, has reduced the amount of illegal off-highway vehicle use and associated impacts.

In 1996, a decision was made to implement the *Catalina Off-Highway Vehicle Recreation Proposal – Redington Pass Area.* Implementation of this decision resulted in mapping of an

approved off-highway vehicle system of roads and trails in the vicinity of Redington Pass, installation of information signboards, marking of existing routes, development of a brochure with map showing route locations, and rehabilitation of two resource problem areas (Race Track Tank and Chiva Falls Road). This decision also provided for construction of a new staging/trailhead area with vehicle loading ramps (Alhambre), construction of restroom and ramada facilities, and creation of three new off-highway vehicle trails. Additionally, the decision amended the 1986 Forest Plan (Amendment 1) to allow motorized vehicles only on designated off-highway vehicle trails. Together, all these improvements have improved the quality of the recreation experience for off-highway vehicle users on the Santa Catalina Ranger District.

Road closures in the vicinity of Sycamore Canyon south of Ruby Road were initiated in 1998. These closures were monitored in 1999 and 2000; monitoring continues. Data obtained in these monitoring efforts needs to be reviewed and, if warranted, updated closure orders need to be issued.

In 1999, decisions based on a categorical exclusion were implemented to provide informational brochures, road number signing, and "Resource Damage, Area Closed" signing in the South Patagonia Off-Highway Vehicle Area (Sierra Vista Ranger District). Implementation also provided users with information brochures indicating roads that allow off-highway vehicle use, fencing of some areas for purposes of protecting the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), and protection of other resource areas. Since 1999, Pima pineapple cactus monitoring and fencing have been in place on the Sierra Vista Ranger District. The fence continues to be monitored by wildlife staff, but the collected data needs to be reviewed to determine if issuing updated closure orders for the enclosure are warranted.

In November 2005, the Forest Service adopted a Travel Management Rule (TMR) governing off-highway vehicle and other motor-vehicle use on National Forest System lands nationwide. Implementation of the Rule guidance is ongoing[2]. The Forest is in the process of identifying and publicizing the system of roads and trails available for public use, including the use types allowed. The most recent amendment to the Forest Plan (Amendment No. 12 in August 2010) incorporated the TMR direction by removing language that allowed for motorized use on certain hiking trails, vehicular access to any area within 300 feet of roads for the purpose of parking and camping, and motorized travel on any roads not posted as closed. The language was replaced with the following direction: "*Motor vehicle use off the designated system of roads, trails, and areas is prohibited, except as identified on a Motor-Vehicle Use Map (MVUM).*" Continual updates to the MVUM, combined with other educational and enforcement tools, should help to protect Forest resources and other uses.

Need for Change Recommendation

The previous evaluation report identified a need to change the way off-highway vehicle use is addressed on the Coronado NF, pointing to an increasing number of off-highway and

[2] Visit http://www.fs.fed.us/recreation/programs/ohv/ for more information on the TMR, travel management directives, and implementation.

motorized vehicles, demand for areas to ride off-highway vehicles, and a need for associated facilities such as trailhead parking, off-loading areas, and camping accommodations. Implementation of the 2005 TMR and subsequent incorporation into the current Plan has addressed some of this need for change; however, as demand continues to increase with population growth, there will be an ongoing need to regulate and enforce the decisions made through TMR implementation.

Issue 3: Use of land for recreational development and dispersed uses, and establishment of equitable fees for recreational use

This issue encompasses three aspects of recreation uses: (a) developed recreation, (b) dispersed recreation, and (c) appropriate fees. The 1992, 1998, 2001, 2002, and 2004 monitoring reports do not consistently address the same topics; some report on visitor use and satisfaction, as well as Recreation Opportunity Spectrum (ROS)[3] settings. Although these are also recreation issues, they are not necessarily directly related to the main topic(s); therefore, good trend analyses are not entirely feasible. What is clear, based on reports and current knowledge, is that recreational demand on the Coronado National Forest continues to grow and budgets sufficient to provide quality developed recreation facilities and high quality management of the numerous dispersed sites across the Forest are not available.

The Coronado NF has at least $3.2 million of deferred maintenance needs in developed recreation sites, with a nearly $800,000 gap to meet annual operations and maintenance needs (both figures are derived from Recreation Facility Analysis data, April 2005). Additionally, many dispersed sites (especially popular off-highway vehicle areas) are heavily impacted by use. User fees alone cannot resolve this problem.

Recreation Facility Analysis (RFA) continues to evolve concurrent with the developments of the INFRA database for Coronado developed sites data. The RFA Program of Work was approved in November 2007 and the Forest will use it to guide decisions about the operation of developed sites on the Forest. When available, this analysis is expected to assist with reducing the deferred maintenance backlog for the five years following its establishment.[4]

The amount of use fees collected in developed sites and high impact recreation areas on the Coronado are expected to increase slightly over the next five years. If the expected increase is combined with appropriated dollars (currently expected to remain at current appropriation levels or below) the Forest can expect no appreciable change in the number of dollars available to maintain the current sites given expected changes implemented from the RFA.

Need for Change Recommendation

The issue here will continue to challenge the Coronado NF. Revision of the 1986 Forest Plan is expected to assist with establishment of management areas that are related to land uses, including identification of places generally suitable for developed and dispersed recreation. Forest Service recreation budget allocations are expected to continue at levels too low to provide quality recreation services; therefore, the Forest will need to use a variety of tools to

[3] More information on the ROS can be obtained by reviewing the USFS General Technical Report at http://www.treesearch.fs.fed.us/pubs/6014

[4] Access the 2007 RFA report and more information at http://www.fs.fed.us/r3/coronado/rfa/index.shtml

provide a base level of recreation opportunities. Some tools may include additional partnerships (with other governments and the private sector), additional user fees, and removing some sites.

The National Visitor Use Monitoring Project produces statistically valid results pertaining to the entire Coronado National Forest; however it does not provide data specific to recreation sites and areas, Ecosystem Management Areas, or ranger districts. If this type of specific data becomes vitally important in the future, additional data-gathering tools will be needed.

Implementation of the results of the RFA over the years 2007 to 2012 will provide direction and resources, including projected slight increases in fee revenues, necessary to continue operation of developed sites to standard and to reduce deferred maintenance.

Issue 4: The role of the private sector in providing recreation services on and adjacent to the national forest must be reassessed

The 1992 evaluation alone does not supply sufficient information to complete a trend analysis for this issue. However, it is anticipated that the Coronado National Forest will need to rely more heavily on assistance from the private sector to provide quality outdoor recreation opportunities to the public in the future. Because the Coronado National Forest encompasses the majority of the high-elevation lands in southeastern Arizona (other nearby lands do not provide similar settings), this private sector help will need to be implemented primarily within the Forest boundaries. The Forest is currently using the 2007 Recreation Facility Analysis to identify on-Forest developed recreation sites for which the Forest Service has insufficient funding for maintenance or operation. This planning can be used to identify sites that could be operated by the private sector.

Using partnerships and volunteers is a continuing trend in the Forest's recreation program, it has been in the past, and will continue to be a major strategy for keeping developed sites and dispersed areas clean and maintained.

Need for Change Recommendation

This is still a valid issue and it will continue to exist on the Coronado National Forest.

Issue 5: Inventory and management planning for the Coronado's many caves and location of this resource to recreational, scientific, and wilderness uses

Trend Analysis 1986 through 2010

Monitoring of certain caves has occurred, including timing issues of entry to certain caves for wildlife protection.

Need for Change Recommendation

A need exists to continue to monitor and protect all cave resources on the Coronado National Forest.

Issue 6: Visual resource integrity in all land management decisions

Trend Analysis 1986 through 2010

The 1992 report focuses on the condition of visual quality since implementation of the Forest Plan, while the 2001, 2002, and 2003 reports discuss visibility due to air pollution from a local smelter for which monitoring was discontinued (because the smelter was removed). Therefore, existing monitoring data provide insufficient information from which to develop a trend analysis.

Nevertheless, the integrity of visual resources remains a concern to be addressed by the Coronado National Forest. Monitoring data show that visual resources and impacts to them are regularly considered during environmental analyses, and that this resource is impacted by management activities and decisions. The impacts are due in part to the inability to protect this resource by any means other than denying implementation of proposals. Monitoring data also show that visual resources are also sometimes impacted by influences beyond the control of the Coronado National Forest.

The trend is that visual quality (scenic integrity) in southeastern Arizona is being degraded. Some forms of this degradation are readily visible, such as urban sprawl along the Forest boundary. There is also a slow loss of scenic landscapes on public lands. These losses are attributable to numerous sources, including but not limited to: (a) illegal border crossers and their associated unplanned trails and camps, piles of trash and debris, and Border Patrol facilities necessary to patrol these areas; (b) technology infrastructure, including utility lines and cellular telephone towers; (c) mining activities; (d) astrophysical facilities; (e) development on private inholdings; (f) resource damage caused by off-highway vehicle use; (g) wildcat target shooting; and (h) natural disturbances (including wildfire and insect/disease outbreaks) that exceed expectations of scale and intensity.

Need for Change Recommendation

This is a major issue on the Coronado National Forest that will continue to grow in significance. Conversion to the Scenery Management System, which has replaced the Visual Resource Management System, will assist with management of this issue, including providing direction for addressing scenery management in land and resource management issues. The Scenery Management System will also allow for ecosystem management projects and prescribed fire, which conflict with the current Visual Quality Objectives in the Forest Plan.

New Issues

1. During Forest Plan revision meetings, the public has repeatedly stated that "quiet" recreation settings are highly valued and are increasingly rare on the Coronado NF.
2. Recreation occurring within close proximity to the U.S.-Mexico international border is being heavily impacted. Illegal border crossers create wildcat trails and leave large amounts of trash; Border Patrol infrastructure (fences, walls, towers) impacts recreation settings; and contact with both illegal and Border Patrol activity threatens visitor safety.

Wilderness

Coronado Forest Plan Wilderness Issues

1. Formulation of a recommendation to Congress concerning Wilderness status for the Bunk Robinson, Whitmire Canyon, and Mount Graham Wilderness Study Areas
2. Within the constraints of the Wilderness Act, decisions are needed concerning the intensity of management and investment for recreation, range, wildlife habitat, and fire management (including planned ignitions) within Wilderness Areas.

Issue 1: Formulation of a recommendation to Congress concerning Wilderness status for the Bunk Robinson, Whitmire Canyon, and Mount Graham Wilderness Study Areas

Trend Analysis 1986 through 2010

The Coronado NF has a demonstrated history of recognizing and protecting wilderness values, evidenced by the establishment of two wilderness areas in the 1930's - three decades before the National Wilderness Preservation System was enacted. The Forest currently manages a total of eight wilderness areas and three wilderness study areas. The Galiuro and Chiricahua Wildernesses were established in 1932 and 1933 respectively. Pursuant to passing the Endangered American Wilderness Act of 1978, Congress designated lands abutting the Tucson valley as the Pusch Ridge Wilderness. The remaining five areas were established in 1984 with the Arizona Wilderness Act: Miller Peak, Mount Wrightson, Pajarita, Rincon Mountain, and Santa Teresa Wildernesses.

The Record of Decision for the 1986 Forest Plan made recommendations for each of the Forest's three Wilderness Study Areas (WSAs): Bunk Robinson, Whitmire Canyon, and Mount Graham; the latter was the only WSA recommended for wilderness designation. The recommendation was forwarded to the Chief of the Forest Service for future action and ultimately awaits an Act of Congress should the administration choose to pursue statutory protection as wilderness.

Bunk Robinson and Whitmire Canyon WSAs were not recommended for wilderness designation with the 1986 Forest Plan. Agency interest in 2005 and 2010 prompted a status review of both; however, no further action has been taken by the Agency or Administration regarding the wilderness status of either area.

Need for Change Recommendation

There is a need to resolve the recommendations in the 1986 Forest Plan regarding wilderness designation or release from WSA-status for each area. Because this requires action at higher levels of the Agency and Administration, the Forest in unable to address this need for change.

Issue 2: Within the constraints of the Wilderness Act, decisions are needed concerning the intensity of management and investment for recreation, range, wildlife habitat, and fire management (including planned ignitions) within Wilderness Areas.

Trend Analysis 1986 through 2010

Wilderness management is addressed in Management Area 9 of the Forest Plan, where each of the above identified resources is considered. The two primary management concerns with respect to wilderness on the Coronado NF are increasing recreational use and catastrophic fire. While several wilderness areas encompass livestock range allotments, monitoring has raised no concerns for range-wilderness interactions. Likewise, monitoring has identified no concerns with management for wildlife habitat in designated wilderness.

Recreational use of wilderness on the Forest is not well understood due to a lack of resources for visitor use monitoring. Several of the previously published monitoring and evaluation summaries include a discussion of the Wilderness Opportunity Spectrum, which helps managers to provide for variations in visitor experiences and recreational use. However, the Coronado NF discontinued its use in the late 1990's.

Fortunately, the National Visitor Use Monitoring (NVUM) Project has provided some valuable information. Based on the 2008 report for the Coronado NF (USDA Forest Service 2008), 18.3 percent of all visits to the Forest during FY 2001, and 17.1 percent during FY 2007, were to designated Wilderness areas. Sampling will continue on a periodic basis with the intent of understanding wilderness use trends over time. At this point, with only two sample years, it is impossible to know whether visitation is increasing commensurate with population growth or if the use of wilderness on the Coronado has stabilized. Once more information on use and capacity are obtained, the Forest can determine whether additional decisions are needed concerning management intensity of resources within wilderness.

With respect to fire, the Forest has a history of extinguishing all fires in wilderness areas, especially when highly visible to the public. Not surprisingly, this practice led to unnatural accumulations of fuel in wilderness areas. Although the 1986 Forest Plan provided some discretion to allow fire use in wilderness, this tool was seldom used. The issue has been exacerbated by the impact to wilderness character of non-native plants and noxious weeds introduced during fire suppression efforts.

The Forest's current Fire Management Plan[5] allows - per Forest Plan Amendment No. 11 - naturally occurring ignitions to be managed to reduce hazardous fuel accumulations, enhance ecosystem health, and maintain natural conditions both within and outside of wilderness. This amendment demonstrated the shift in fire management policy from suppression to restoration across the National Forest System; it further prioritized a return to natural fire regimes in wilderness and non-wilderness lands on the Coronado NF.

Need for Change Recommendation

Impacts to wilderness from human use and naturally occurring events is inevitable. Two needs for change were identified in previous reports: (1) a need to keep wilderness areas

[5] The 2011 Fire Management Plan is available at: http://www.fs.fed.us/r3/coronado/forest/fire/fire.shtml

protected from human impacts through use of minimum requirements analyses[6]; and (2) a need to re-establish a more natural fire regime. The former need could be formalized through updated Forest Plan direction and should be considered by the revision team; incorporating Minimum Impact Suppression Tactics (MIST)[7] in Forest Plan guidance might also be an appropriate mechanism for reducing impacts to wilderness character during fire management. The latter need is being met through implementation of revised fire management policies that prioritize restoration of natural fire regimes – only time is required to allow restoration to occur.

New Issues

Recommendations for wilderness management need to be formalized through development of wilderness management plans for each wilderness area, based in part on current and succeeding results of the National Visitor Use Monitoring Project, as well as the tools available in the INFRA database and its associated monitoring, the Forest's Wilderness Education Plan, the Chief's 10-Year Wilderness Stewardship Challenge, and evolving national direction.

Border crossings have escalated in the Miller Peak, Pajarita, and to a lesser extent, Mount Wrightson Wildernesses. This trend is expected to continue as the population in adjacent areas of the Republic of Mexico increases and the social climate of Mexico remains unchanged. The Forest needs to continue ongoing cooperative efforts with the US Border Patrol to educate Border Patrol agents and administration on Forest Service wilderness policies and continue to coordinate with them regarding the Border Strategy, which is being jointly developed by the two agencies to address the impacts of border crossing on resources including wilderness.

Another new issue is the Tumacacori Highlands proposed wilderness area. On January 10, 2004, Representative Raul Grijalva (D. AZ) held a news conference to announce his intent to introduce legislation that would establish the Tumacacori Highlands Wilderness Area in the Tumacacori Mountains of the Coronado NF. On August 1, 2007, Representative Grijalva introduced legislation (H.R. 3287) for the proposed wilderness. The area would be located approximately 54 miles southwest of Tucson, Arizona, and would include approximately 70,000 acres of the Tumacacori Mountains. The proposal would also expand the existing Pajarita Wilderness from 7,400 acres to 13,000 acres, including lands that abut the international boundary with the Republic of Mexico. Proponents of this legislation claim support from a variety of local, state, and national groups. As of 2010, the proposal is still being considered but has lost momentum due to a less receptive political environment.

---

[6] The Coronado NF utilizes the multi-agency endorsed Minimum Requirements Decision Guide for decisions related to the minimum tool necessary in wilderness, available at: http://www.wilderness.net/index.cfm?fuse=MRDG

[7] MIST are multi-agency endorsed techniques for minimizing impacts during suppression activities.

Cultural Resources

Issue: The amount of time and investment to interpretation of cultural resources

Trend Analysis 1986 through 2010

The amount of time and investment to interpretation of cultural resources was previously identified for cultural resources, along with two topics: (1) avoidance of damage to or loss of cultural resources through ground-disturbing activities, and (2) loss or damage to cultural resources through natural erosion or human vandalism.

Avoidance of Damage to or Loss of Cultural Resources through Ground-Disturbing Activities: Cultural resource compliance was relatively new in 1986 and basic procedures not known to all Coronado NF project managers. In the period from 1986 to 2010, relatively few cases of damage to or destruction of cultural resources through ground-disturbing activities was documented. No clear trend is evident from past monitoring; however, Coronado NF archeologists suggest the trend for frequency of damage incidents is downward. More incidents of damage by ground-disturbing activities occurred in the late 1980's and early 1990's than have occurred in recent years. One reason for this suggested downward trend is increased familiarity of Coronado NF personnel with basic cultural resource procedures for complying with the National Historic Preservation Act, specifically the use of archaeological survey prior to ground-disturbing activities to identify and avoid significant cultural resource sites. The majority of instances of damage by ground-disturbing activities in recent years have been by persons outside the agency, either members of the public or other agencies.

One theme throughout the monitoring period has been a relatively low level of post-project monitoring. Annual reports typically noted: (a) *"funding has been insufficient in many cases to conduct an adequate level of inspection and to document the results,"* and (b) that a more effective monitoring program *"will be increasingly important, not only for revision of the Forest Plan, but also to be responsive to the Native American tribes with whom the Forest consults under the National Historic Preservation Act."*

Loss or Damage to Cultural Resources through Natural Erosion or Human Vandalism: No obvious trend is expressed in the documented annual summaries for this topic. Nevertheless, the personal familiarity of the Coronado NF archeologists with program implementation suggests there is a slight downward trend in the period from 1986 to 2010, and a stronger downward trend when compared with the period prior to 1986.

"Natural erosion" seems to have been a greater concern in 1986 than now. Several archaeological sites that were experiencing damage through active erosion at that time appear less threatened now. Factors involved in the suggested downward trend include: (a) the implementation of site stabilization measures in a number of cases, and (b) a perceived improvement in overall rangeland conditions with fewer damaging active erosion conditions, at least partially attributable to favorable management practices.

Alternatively, one notable upward trend has been from damage caused by major wildland fires and subsequent associated major runoff events along stream channels draining fire-

affected watersheds. The mid-1990's initiation of larger and more catastrophic wildland fires had an increased effect on cultural resources. This trend is expected to continue.

Regarding human vandalism, there is a slight, but still ambiguous, downward trend since 1986. Acts of looting and other vandalism have occurred throughout the period but with relatively low frequencies, especially in comparison with other areas in the Southwest. The few major archaeological sites that have been the targets of repeated looting have been subject to less damage in recent years than previously. Reasons for this reduction in looting and vandalism are thought to be partially attributable to more effective protection measures. Implementation of public volunteer programs such as the Arizona Site Stewards and Forest Service Passport-in-Time Program[8] have lead to increased site monitoring and site protection activities. In addition, there is a perceived region-wide change in public behavior whereby major looting at archaeological sites has become less appealing or deemed less acceptable than it was in the period from 1970 to 1980. However, 2010 saw a minor upturn in cases of vandalism. One Archaeological Resources Protection Act (ARPA) case was investigated by Coronado NF archaeologists and Law Enforcement in FY2010, and a second ARPA case was settled. Due to increasing populations near National Forest System lands, acts of vandalism to cultural resource sites are expected to continue.

Need for Change Recommendation

The single issue identified in 1986 has changed as the passage of time led to a change in focus. Many of the cultural resource issues that involved substantial time and energy in 2010 were not identified in 1986. The 1986 issue, "the amount of time and investment to interpretation of cultural resources," appears to be too limited in scope and unrelated to the two topics listed, which include nothing about interpretation. The issue of interpretation and investment of time and money is worth developing further. A more comprehensive issue would focus on the management of cultural resources, including the aspects of identification, protection, and interpretation.

The topic, "loss or damage to cultural resources through natural erosion or human vandalism," could be better stated. As noted above, catastrophic wildland fire has become a greater threat in the past decade, but is not encompassed by an issue statement focusing on "natural erosion or human vandalism." Additionally, these older topics indicate a focus on threats to archaeological sites.

New Issues

There is a growing need to align Heritage and Cultural Resource program management focus to deal with the following aspects of the cultural resource program:

- Historic buildings, their preservation needs and costs, and the threats to them from fire and deterioration are important issues that need consideration
- Consultation and interaction with Native American tribes needs to address the several statutes, Executive Orders, and modifications to implementing regulations of existing

[8] Visit http://www.passportintime.com/ for more information

statutes that have occurred in the past 20 years resulting in increased involvement with tribal governments

Wildlife and Fish

Coronado Forest Plan Wildlife and Fish Issues

1. The amount of time to be given between threatened, endangered, or unique species; and other flora and fauna
2. Critical wildlife habitat must be identified, along with needed controls on other uses (mineral extraction, recreation, etc.)
3. Appropriateness of predator and rodent control, when and where
4. Fishing lakes which will be maintained and consideration of any new construction
5. Maintenance and improvement of the wildlife habitat for future generations in conjunction with other Forest activities

Issue 1: The amount of time to be given between threatened, endangered, or unique species; and other flora and fauna

Trend Analysis 1986 through 2010

The number of federally listed species has grown since the adoption of the 1986 Forest Plan. Additionally, a number of Forest Plan amendments were adopted; all of which addressed wildlife, fish, or rare plants to some degree; increasing the complexity of implementing Forest Plan direction. Of particular note were standards and guidelines added to address habitat and population management for the Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*), Mexican spotted owl (*Strix occidentalis lucida*), and northern (Apache) goshawk (*Accipiter gentiles apache*).

In the late 1980s, extensive surveys of Mexican spotted owls were completed across the Coronado, providing accurate baseline information about the pairs found on-forest and their reproductive output. Protected Area Centers were established for the Mexican spotted owl. A similar emphasis was placed on surveying for and establishing habitat management areas for the northern (Apache) goshawk. Also in this time period, species management efforts were proactive as evidenced in program management related to a number of federally listed species. Efforts began on all of these organisms when they were proposed for federal listing, rather than only addressing conservation issues in response to Endangered Species Act compliance. Coronado NF biologists provided leadership for implementation of the Recovery Plan for the Mount Graham red squirrel, including inventories and follow-up monitoring. Forestwide surveys were also conducted for the cactus ferruginous pygmy-owl (*Glaucidium californicum*), Chiricahua leopard frog (*Rana chiricahuensis*), and lesser long-nosed bat (*Leptonycteris yerbabuenae*).

The Coronado National Forest hosts habitat for three (3) threatened and endangered plants, as well as about ninety (90) taxa listed on the Southwestern Regional Forester's (R3) Sensitive Species List. In the 1990's, through a cost-share agreement with The Nature Conservancy, the Forest botanist developed methods to improve understanding of the Coronado's rare plant resources and their habitat relationships, resulting in analysis of field monitoring efforts,

trend identification, and recommendations for future monitoring, which were subsequently implemented. The three federally listed plants were the focus of the project, but surveys were also conducted for plants being considered for listing, as well as other rare plant species. Management Area 15 was created through a Forest Plan change notice process (Change Notice Number 3, 1999) which formalized the new Wild Chile Botanical Area for protection of wild chiltepin (*Capsicum anuum*).

One aspect of "other flora and fauna" referred to in this issue relates to publicly high-profile species that are favorites of hunters and anglers. A number of game species favored by hunters have received attention on the Coronado National Forest. Three (3) of these are species of quail that draw out-of-State hunters, especially the Montezuma (Mearn's) Quail (*Cyrtonyx montezumae*). Likewise, the desert bighorn sheep (*Ovis canadensis nelsoni*) of the Coronado National Forest have been the subject of much research and intensive management for decades. Extensive re-introduction efforts have been made to re-establish Gould's turkeys (*Meleagris gallopavo mexicana*) on the Coronado, and black bears (*Ursus americanus*) and mountain lions (*Felis concolor*) have received considerable attention due to human safety and property damage concerns.

Current understanding of conditions to support sustainability of flora and fauna is that some anthropogenic and natural effects on the environment have increased and this trend is expected to continue. For example, global climate change, urbanization, and fire suppression have had profound effects on the natural environment. Terrestrially, grasslands, woodlands, and forests and their denizens are at risk from catastrophic events (severe wildfire, uncharacteristic insect outbreaks). The situation is worse on the aquatic front with severe droughts and loss of the water table. The outcome is that the Coronado National Forest is facing extirpations and extinctions that were not even considered in the 1986 Forest Plan.

The 1998 Monitoring and Evaluation Report only addressed some monitoring of five plant species, a very low number considering there are over 100 species of conservation concern identified in the various lists. In general, plant conservation concerns have been largely neglected, with the exception of federally listed species.

The 2001, 2002, 2003, and 2004 monitoring reports were somewhat less relevant in that they largely addressed the utility of the MIS selected for the Coronado National Forest; basically, these reports conclude that the utility of the Forest's MIS is limited. The most recent MIS Status Report is a more appropriate substitute for this content and is attached as Appendix B.

In 2008, two species that occur on the Coronado were listed under the Endangered Species Act as candidate species: The Arizona treefrog and Mexican gartersnake. The Arizona treefrog is found on the Huachuca Ecosystem Management Area, in the Huachuca and Canelo Hills. It is only known from a handful of localities. One site, Scotia Canyon, is the site of a rare plant and wildlife restoration project, where effects of the project needed to be considered. The Mexican gartersnake is also found in the area, and one individual was found in Scotia Canyon—the first in several years. It was formerly widespread in southeastern Arizona, but it has been extirpated from most of its former range and now is only known (on the Coronado) in the Huachuca EMA. Surveys for a project in the Canelo Hills (Redrock Canyon) also yielded a single individual. Coronado NF biologists have participated on teams

to decide how to manage these species, even though they are not federally listed as threatened or endangered species yet.

Between 2008 and 2009, there were many changes with respect to listing status under ESA. Critical habitat was proposed for the Chiricahua leopard frog and jaguar. The cactus ferruginous pygmy-owl (formerly listed, then de-listed) went under a 12-month status review. The Yellow-billed cuckoo became a candidate for federal listing (populations west of the Rio Grande corridor). Stephan's riffle beetle also became a candidate species. Several 90-day findings from a large proposal to list hundreds of species commenced. These findings show that there is significant information on the species to warrant further work to determine if federal listing under the ESA is warranted. On the Coronado NF, these species include:

- Notothenid moth (*Astylus* sp. 1)
- Notothenid moth (*Heterocampa* sp. 2 nr. *amanda*)
- Notothenid moth (*Litodonta* sp 2 nr. *alpine*)
- Sabino Dancer (Damselfly)
- White-sided Jackrabbit
- Chihuahua Scurfpea (not detected on Coronado NF, but habitat present)
- Santa Rita Yellowshow
- Huachuca Milkvetch
- Chisos Coralroot (since taxonomically split, now *Hexalectris colemanii*, endemic to Arizona and possibly the Coronado NF)
- Desert Tortoise ("Sonoran" population)
- Huachuca Springsnail
- Pinaleño Talussnail (see below about Conservation Agreement)
- Wet Canyon Talussnail (see below about Conservation Agreement)

This is the largest number of species with 90-day findings for any known time period, and if these species warrant federal listing, the workload of Coronado NF biologists will increase proportionally. The Coronado NF has more species on the current ESA list and the 90-day finding list than any other Forest in the Region, and perhaps the nation. The workload from these findings will come as participation in status reviews and information retrieval, re-initiating Section 7 consultation, Freedom of Information Act requests, Conservation Agreements, Safeharbor Agreements, and extra time requirements for Biological Assessments. Current workload includes a Conservation Agreement for the Wet Canyon Talussnail, Pinaleño Talussnail, and four other land mollusks in the Pinaleño Mountains. Conservation Agreements are often done to help offset the need of listing under the Endangered Species Act (there are no guarantees that species under an agreement will not be listed, however). Although the Bald Eagle was de-listed elsewhere, the listing was retained for the Sonoran Desert Population, and there are still needs to address this species under the

Bald and Golden Eagle Protection Act. There is now a requirement to obtain Incidental Take Permits for Bald and Golden Eagles under certain circumstances.

Most of the species considered in 2009 are now in a four-year status-review period identified by the US Fish and Wildlife Service. Also, status review has been given a higher priority than in subsequent years. The number of species to be considered continues to rise, with the following being added to the list of potential future federally listed threatened and endangered species.

- Rosemont Talussnail (candidate)
- Coleman's Coral-root (petitioned)
- Beardless Chinch-weed (petitioned)
- Sonoran Talussnail (petitioned)
- Arizona Treefrog (candidate)
- Cactus-ferruginous Pygmy-Owl (delisted, then re-petitioned)
- Mexican Gartersnake (candidate)
- Bartram's Stonecrop (petitioned)
- Morafka's Desert Tortoise (= Sonoran Desert Tortoise, but at full species level) now a candidate
- Stephan's Heterelmis Beetle (candidate)

There is also a new draft recovery plan for both Mexican Spotted Owl and Mount Graham Red Squirrel. Jaguar and Ocelot have gained much recent attention—at least two confirmed Ocelot records on the Coronado NF surfaced in the past year or so. Designation of Jaguar critical habitat is likely in the near future. The Giant Spotted Whiptail, a Forest Service sensitive species, is now recognized as a distinct species, rather than a subspecies of a largely Mexican species.

Need for Change Recommendation

The number of taxa listed as threatened or endangered will increase in the future, and there will be a concomitant increase in work required. These anticipated future trends indicate that Issue 1 is still relevant, with perhaps a broader scope.

Issue 2: Critical wildlife habitat must be identified, along with needed controls on other uses (mineral extraction, recreation, etc.)

Trend Analysis 1986 through 2010

The term "critical habitat" has a special meaning with regard to areas established by the USDI Fish and Wildlife Service for threatened and endangered species. For purposes of this review, the term is being used in a different context; it is used here to refer to areas that are important to species of conservation concern.

Since the 1986 Forest Plan was adopted, the Forest Service has changed its approach for addressing species needs in forest plans from a project-by-project approach to one that encompasses a more comprehensive strategy. This broader view is a foundational element of the ecosystem sustainability concept. While there will still be a place for project-by-project evaluation for certain species, the majority of future forest planning will likely be undertaken using ecosystem sustainability concepts.

Aquatic wildlife resources are currently in a dire state of affairs. This is due in part to a drought that began around 1996 (still persisting, and likely to persist for an extended time), but also the affects of anthropogenic changes and demands of a burgeoning population. Since that time, little has been done to offset the widespread decline in native aquatic and semi-aquatic species.

One of the largest projects ever proposed on the Coronado NF, a copper mine that could affect 4,500 acres in the Santa Rita Mountains, is currently in review under the National Environmental Policy Act. Effects to wildlife habitat have been identified as an issue in this process.

Need for Change Recommendation

This issue still exists, but the issue statement is misleading because of alternate use of the term "critical habitat" by the USDI Fish and Wildlife Service. "Needed controls" for mineral extraction are limited, however, the Forest Service can be involved with retention of "mitigation lands" for conservation purposes (not necessarily lands administered by the Forest Service).

Issue 3: Appropriateness of predator and rodent control, when and where

Trend Analysis 1986 through 2010

This issue is largely outside the authority of the Coronado National Forest. The Coronado is operating under a National Memorandum-of-Understanding between the Forest Service and State and Federal wildlife services. Each year, the participant agencies meet and discuss plans for the upcoming year. The focus of these meetings have been almost entirely on livestock predation concerns, with the exception of black bear incident management and the 2004 Sabino Canyon mountain lion incidents and related management actions.

In 2008, a related issue from a Memorandum-of-Understanding between Forest Service and Animal and Plant Health Inspection Service, Wildlife Services developed. The MOU allows for the use of pesticides to control grasshoppers and Mormon crickets on public rangelands. This is problematic because pesticides are toxic to grasshoppers and other insects, some of which appear on lists of sensitive species. These toxins also threaten vertebrates through pollution, or entering the food chain, as with the decline of the American Peregrine Falcon.

Need for Change Recommendation

This issue is still relevant.

Issue 4: Fishing lakes which will be maintained and consideration of any new construction

Trend Analysis 1986 through 2010

Siltation of lakes on the Coronado continues to be a problem that has been exacerbated over time by increased sediment runoff following large, severe wildfires across the Coronado National Forest in recent years. Fishing lakes have proved to be problematic from a maintenance standpoint. Besides runoff, algal growth can be tremendous, and undesirable non-natives are an issue. Fishing lakes can be a source of undesirable non-natives, including bullfrogs (*Lithobates catesbeianus*), crayfish (*Orconectes spp.*), and certain warm-water fishes, all of which threaten native fauna. No new fishing lakes have been proposed.

In 2010, Peña Blanca Lake refilled, after having been drained and having toxic sediment removed. An invasive species, American Bullfrog, was essentially eradicated from the lake and most of the area within 5 miles of the lake, largely due to the efforts of Arizona Game and Fish Department and the Sky Island Alliance. The lake was restocked with sport fishes, and Chiricahua Leopard Frogs naturally repopulated portions of the lake.

Need for Change Recommendation

Fishing lakes are popular with the public, but are generally ecologically problematic (e.g., because of invasive species and diverting water), so from an ecological prospective, no new lakes should be recommended. This issue remains.

Issue 5: Maintenance and improvement of the wildlife habitat for future generations in conjunction with other Forest activities

Trend Analysis 1986 through 2010

The Wildlife, Fisheries, and Rare Plants Program is primarily focused on supporting other program management needs. Projects to improve the welfare of wildlife, fisheries, and rare plants are largely dependent on funding from partners and other outside sources.

In recent years, the consequences of fire suppression and drought have manifested themselves to such an extent that many species are on the verge of extirpation or extinction (e.g., most aquatic species and the Mount Graham red squirrel). National and regional direction are addressing some of these issues (e.g., terrestrial fuel loads as one of the Southwest Region's priorities), but diminishing habitat for aquatic species remains a complicated problem with no clear solutions, even though many taxa are most at risk. Many of these species were not identified as species of conservation concern in the 1986 Forest Plan—indeed most verbiage addressed terrestrial species with much larger ranges.

Need for Change Recommendation

Carry this issue forward.

New Issues

While not necessarily new issues, the magnitude of concern for species and habitat conservation have, over the monitoring period increased dramatically. In some cases, issues have risen in the level of concern:

- Drought, anthropogenic changes, loss and draw-down of aquifers and water tables and other disturbance pressures from population increases in the Southwest have placed aquatic wildlife resources in a dire state with little being done to offset widespread decline in native aquatic and semi-aquatic species.
- Decades of fire suppression, exacerbated by climate changes are manifesting to the extent that many species are on the verge of extirpation or extinction (e.g., most aquatic species and the Mount Graham red squirrel).
- Drought, urbanization, and fire suppression have had profound effects on the natural environment. Terrestrially, grasslands, woodlands, and forests and their denizens are at risk from catastrophic events (*e.g.* severe wildfire, uncharacteristic insect outbreaks).
- Plant conservation continues to be a concern that is often overshadowed, with the exception of federally listed species.
- Invasive, non-native species are one of the greatest threats to the sustainability of native species. While many of these are plants, there is also a burgeoning problem with invasive animals, including invertebrates and even game species.
- Appropriateness of introductions of flora and fauna that have not been documented for a specific site needs further assessment. For example, is it appropriate to introduce fishes in areas outside of their documented range as part of a recovery effort?
- Climate changes affect species conservation actions and mitigation practices.

Range

Coronado Forest Plan Range Issues

1. Manage Forest lands for grazing in relation to other uses
2. Where permitted use exceeds capacity, an appropriate combination of management changes and numbers adjustments must be determined. Scheduling of needed changes is also important.

Issue 1: Manage Forest lands for grazing in relation to other uses

Trend Analysis 1986 through 2010

Livestock grazing is balanced with other uses through decisions arising from environmental analysis pursuant to the National Environmental Policy Act (NEPA). Interested parties, affected parties as well as other agencies, local and state governments and tribes are afforded involvement within the NEPA process. Additionally, NEPA is preceded by the Plan-to-Project analysis, conducted by a forest service interdisciplinary team, in collaboration with the permittee, in which, desired conditions, existing conditions, and resource management objectives to address resource management needs are determined. Possible management practices and information needs are also determined during the Plan-to-Project analysis. Subsequent to the NEPA decision, an Allotment Management Plan (AMP) is developed. All allotments currently being grazed on the Coronado National Forest are under an AMP. All of these documents are considered part of the grazing permit, which is required before permitted grazing occurs on National Forest System lands.

As individual environmental analyses are completed and AMPs are compiled or updated, other uses are considered and proposals are developed to alleviate or minimize conflicts with other land uses. The majority of the active allotments on the forest have a NEPA analysis completed; the several remaining ones are on schedule for completion by the end of fiscal year 2013.

Periodically (3-5 years), a review the NEPA documentation and decision to determine consistency with the existing grazing permit, AMP, and AOI are planned. This review would be necessary prior to permit expiration and/or reauthorization of grazing occurring. Review may also be needed should new information become available or if effectiveness monitoring indicates planned management needs to be altered from that which was analyzed. If information supports the existing decision, grazing activities continue, if not further NEPA analysis is completed.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended.

Issue 2: Where permitted use exceeds capacity, an appropriate combination of management changes and numbers adjustments must be determined. Scheduling of needed changes is also important.

Trend Analysis 1986 through 2010

As described in the analysis for Issue 1 above, the interdisciplinary "Plan-to-Project" process and subsequent NEPA analyses for Coronado NF grazing allotments considers grazing capacities with respect to existing conditions and desired future conditions. Adjustments in permitted numbers have occurred across the Forest over the last 25 years and adjustments in livestock occur from grazing year to grazing year; however, decreases in numbers are not significant. Variable stocking based upon current and local conditions is exercised through the Annual Operating Instructions (AOI). In recent years, prolonged drought conditions have realized actual livestock use to 50-60 % of permitted numbers. The mechanism of modifying grazing management and subsequent livestock stocking rates through the AOI has been successful in meeting this issue.

Recent NEPA has incorporated similar adaptive management principles which advocated variable stocking rates based upon current and local conditions.

A long-term drying trend has been realized during this time frame resulting in less available forage and stock tank waters, thus less "actual" livestock grazed. Additionally, efforts across the forest to develop permanent livestock water systems and associated range improvement infrastructure have greatly improved the ability of grazing management to be flexible and adaptive to the dynamic nature of annual precipitation and subsequent forage production and stock water availability.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended.

New Issues

Climate change is predicted to elevate the occurrence of wildfires on the Coronado National Forest resulting in destruction of range improvement infrastructure and periods of time in which forage for livestock is unavailable due to consumption from fire.

The occurrence of fire on the Coronado has dramatically increased in the last 10 years. Dryer conditions are apparent as well as ignitions that are human caused. This impact directly affects the ability to manage grazing due to destruction of range improvements. Additionally, replacements of these improvements are vital to the ranching operations to remain viable. Funding is many times non-existent or greatly lacking. Also of concern, fires that consume forage available for livestock in large areas can greatly affect the viability of ranching operations and the ability of grazing management to meet resource objectives.

Timber and Forest Products

Coronado Forest Plan Timber and Forest Products Issues

1. Distribution of forest products between commercial users and personal use, and availability of permits to non-citizens
2. Timber harvest amount and objectives
3. Silvicultural systems and harvest techniques, including clearcutting, snag management, timber stand improvement, reforestation, and harvest of green or dead fuelwood

Issue 1: Distribution of forest products between commercial users and personal use, and availability of permits to non-citizens

Trend Analysis 1986 through 2010

Records indicate that the number of fuelwood permits and volume of wood sold began to increase beginning in 2002. Fuelwood permits are only sold for personal use. The limit of 1 or 2 cords of wood per permit was lifted. A limited number of permits are available annually; these permits are issued on a first-come basis.

The demand for other forest products, such as beargrass, remains limited. All products remain available by permit to United States citizens and non-citizens alike. By far, the most permits go to people living in the United States.

A significant revision of the Forest fuelwood policy occurred following a review of the forestry program in June of 2010. The Forest established a working group to revise and standardize the fuelwood permitting policy across the Forest. This new policy is planned to become effective for the 2012 fiscal year.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended.

Issue 2: Timber harvest amount and objectives

Trend Analysis 1986 through 2010

Vegetation manipulation tables for timber and fuelwood were removed by Change Notice 2, June, 1996.

The amount of growth has greatly surpassed the amount offered, but much of this net growth is located in areas that are not readily accessible for timber harvest. Harvest amounts have remained fairly static and well below the level of available volume described in the Forest Plan. This is in agreement with Forest Plan direction to, *"Continue a program that enhances other resource values, and that effectively utilizes the wood fiber produced. Carry out silvicultural practices to improve stand health when such practices are consistent with other resource objectives."*

Recent wildfires have altered much of the landscape, and project proposals designed to reduce fire hazards have increased in keeping with Forest Plan objectives.

Need for Change Recommendation

Monitoring of objectives for timber harvest completed for several timber and fuelwood sales throughout the Coronado indicates that the desired wildlife habitat emphasis for coniferous forest areas has been changing since the Forest Plan was developed. Concerns about retention of old growth ecosystems and habitat for species, such as the Mount Graham red squirrel, Mexican spotted owl, and goshawks remain high. A re-evaluation of the suitability of lands to sustain a commercial timber sale program was completed during early Forest Plan revision efforts. In addition, the need for, and methods of, monitoring should be reassessed. The Forest Plan monitoring requirement to compare total cords made available to the projected output is not appropriate in light of program objectives, nor is this method of monitoring aligned with recent Forest Service policy to keep forest plans strategic and focused on outcomes rather than outputs.

Issue 3: Silvicultural systems and harvest techniques, including clearcutting, snag management, timber stand improvement, reforestation, and harvest of green or dead fuelwood

Trend Analysis 1986 through 2010

When the Forest Plan was approved in 1986, the acreage determined to be suitable for sustained timber harvest was 13,729 acres with an annual harvest estimated at 455,000 board feet. Objectives, standards, and guidelines for conducting timber sales were contained under Management Area 2. In 1989, the Forest Plan was amended (Amendment 4) to accommodate habitat needs for the Mount Graham red squirrel resulting in reductions of the suitable timber land base to 5,000 acres and an estimated annual harvest of 255,000 board feet.

Standards and guidelines for managing areas determined to be suitable for both timber and fuelwood harvests are found in the individual Management Area prescriptions. In addition, standards and guidelines for mitigating impacts of wood harvest on other resources are found in the Forestwide management prescription, as well as in individual Management Area prescriptions. Monitoring of specific fuelwood and timber sales since 1986 indicates these standards and guidelines are still valid, and are being appropriately supplemented on a project-by-project basis to meet management objectives for a specific area.

Vegetation manipulation tables for timber and fuelwood were removed from the Forest Plan in 1996 through Change Notice 2.

Changes in staffing and program management have improved the Coronado's ability to treat forest vegetation more effectively.

Need for Change Recommendation

The need for, and methods of, monitoring should be reassessed.

New Issues

Vegetation manipulation projects, including prescribed fire, need to have silvicultural prescriptions described for each ranger district. Forest Service policy directs that silvicultural prescriptions must be prepared for all timber and woodland projects manipulating trees. Prescriptions are required prior to implementing work. The prescriptions must be signed by a certified silviculturist.

Plant and Animal Diversity

Coronado Forest Plan Plant and Animal Diversity Issues

1. Location and extent of vegetative manipulation
2. Selection of species for revegetation
3. Management of uses and management of practices in riparian areas

Issue 1: Location and extent of vegetative manipulation

Trend Analysis 1986 through 2010

There is insufficient data to establish a trend, but monitoring of projects indicates no need to modify current management practices.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended

Issue 2: Selection of species for revegetation

Trend Analysis 1986 through 2010

There remains a continuing concern about the use of exotic or non-native plant species in revegetation projects. Forest Service preference is to use native species where practical and cost-effective in meeting desired management objectives; or to encourage natural seeding from established sources where feasible. The exception to these practices is the use of naturalized non-natives for restoration following catastrophic events (fire and flooding).

Need for Change Recommendation

No need for change in Forest Plan direction is recommended.

Issue 3: Management of uses and management of practices in riparian areas

Trend Analysis 1986 through 2010

Forestwide, riparian area channel stability as measured by bank protection, cross-section dimensions, and pebble counts has been steadily improving in response to improved range and recreation management. However, riparian areas have been observed to have declining canopy cover since 2003, apparently due to drought, and channel stability has declined downstream from each of the major wildfires experienced on the Coronado (2002 Bullock Fire, 2003 Aspen Fire, 2004 Nuttall Complex Fire, and 2005 Florida Fire). Observations of riparian areas downstream from the 1994 Rattlesnake Fire indicate that channel conditions altered due to wildfire in the watershed will improve with time under good management conditions.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended.

New Issues

No new issues were identified.

Soil and Water

Issue: Management of Forest resources to protect or enhance watershed condition from both a hydrologic and soil productivity standpoint

Trend Analysis 1986 through 2010

Over the planning period, the 21 watershed boundaries originally delineated in 1986 were changed to the 50 watershed delineations in current use.

Assessment of upland conditions using the soil quality categories addressed in Forest Service Handbook 2509.18 has continued since 1999. A total of 1,131,230 acres have been assessed in the field and documented.

The trend in soil condition and consequently overall watershed condition is up. The exceptions are locations where wildfire has severely burned an area, and where groundcover by plant basal area and vegetative litter is greatly reduced for 3 to 5 years. Most burned areas are recovering at the expected rate.

Need for Change Recommendation

The current method for evaluating watersheds has changed from only assessing vegetative groundcover to a combination of soil, aquatic, and riparian systems assessments. The method defined in the 1986 Forest Plan is now outdated, and the language needs to be changed to reflect new methodology.

New Issues

No new issues were identified.

Minerals

Issue: Identification of sensitive areas and formulation of recommendations for needed withdrawals from mineral entry

Much of the Coronado NF remains open to mineral entry for exploration and development purposes. The Forest Plan identifies a number of unique resource areas where no reasonable alternative to withdrawal would provide adequate protection. As part of implementation of this management direction, selected areas were initially identified and recommendations for potential mineral withdrawals were made to the USDI Bureau of Land Management during the initial five year period 1987 to 1991 and two mineral withdrawals were finalized. From 1991 to the present, six mineral withdrawals were finalized which will require renewal in 2014 and the two the earlier two withdrawal were renewed while fourteen other areas were evaluated. Further evaluation of sensitive Forest resources and increasing interest in the mineral potential on Forest lands has increased the pressure to evaluate these and other eligible areas which may qualify for withdrawal from mineral entry. Recently, there has been increased pressure to withdraw Forest lands proposed for mining activity.

Trend Analysis 1986 through 2010

Several new administrative withdrawals were made on the Forest and two expiring mineral withdrawals were renewed during this period. Several other administrative mineral withdrawals were proposed between 2001 and 2004 in part because of direction in the Forest Plan for the different management areas. These are currently being analyzed, and include heritage sites, the Wild Chili Botanical Area, several caves, and Guidani Basin, which could adversely impact the Kartchner Caverns State Park. Two areas, the Florida Administrative Site, and the Cave Creek area, were withdrawn by Acts of Congress.

Rapidly rising mineral and metal prices since 2006 has resulted in an increase in mineral exploration and mining proposals on Forest lands within the Santa Rita, Patagonia, and Dragoon Mountains and the Tumacacori AMA. Most of the proposed exploration was for copper and more recently for gold and silver. An exploration program for manganese-silver mineralization on patented mining claims in the Patagonia Mountains began in 2007 and is now proposing to expand testing onto adjacent Forest lands. In addition to the exploratory drilling proposals, a proposed limestone quarry in the Dragoon Mountains is under consideration. NEPA analysis is underway to evaluate a proposed plan of operations for the Rosemont open-pit copper mine and support facilities in the northeastern part of the Santa Rita Mountains submitted to the Forest by Augusta Resource Corporation in August in 2006.

In addition to the permitted but currently dormant limestone quarry in the Santa Rita Mountains, mineral developments in the coming decade could include the Rosemont open pit copper mine, the Dragoon limestone quarry and the possible development of the Hardshell manganese-silver open pit mine. It is anticipated that continued artisanal gold operations at Greaterville and Ash Canyon will continue and that exploration for copper in the Patagonia and Santa Rita Mountains will be ongoing.

Need for Change Recommendation

The use of mineral withdrawals should continue to be considered as a means to protect resources and high value improvements, however all areas being considered for mineral withdrawal should be carefully reviewed in terms of both area sensitivity as well as the eligibility and appropriateness for withdrawal under applicable Federal policies. In addition, the potential for the development of mineral resources should be seriously considered prior to making withdrawals.

As an alternative to identifying specific areas for mineral withdrawal in the Forest Plan, criteria should be established as a guide to the future selection of areas appropriate for protection under the provisions of a mineral withdrawal, considering both the desires of the Forest and the guidelines established by the Bureau of Land Management which must be adhered to.

New Issues

The exploration activity in the Patagonia Mountains and the proposed mine in the Santa Rita Mountains have raised strong opposition from local communities. As a result, the Pima County and Santa Cruz County Boards of Supervisors have passed resolutions opposing mining in the two mountain ranges. They have also asked for help in stopping mining from their Congressional and Senate Delegation; specifically they've asked that Congress withdraw the two mountain ranges from mineral entry. Furthermore, they've asked that the Federal government purchase the private land that much of Augusta Resource Corporation's ore body lies within. Changes to the mining laws have been proposed in Congress, with the proposed Rosemont Mine being used as an example of how mining impacts the environment. There has also been opposition to the possibility of a marble quarry expansion following exploration for marble in the northern Dragoon Mountains. Opponents of the quarry development had previously requested that the Forest take action to withdraw the area from mineral entry and suggestions have been made that the Forest Service should review the validity of mining claims currently permitted for mining in the Santa Rita Mountains.

Lands and Special Uses

Coronado Forest Plan Lands and Special Uses Issues

1. Revision of land ownership adjustment plans to update lands desirable for acquisition and available for disposal
2. Allocation of national forest land for special uses such as commercial development, summer homes, utility corridors, scientific study sites, roads, apiary sites, ski areas, etc.
3. Management of national forest land for astrophysical research purposes on Mount Graham. (This issue and the specific concerns and opportunities related to it are being analyzed in a separate environmental impact statement.)

Issue 1: Revision of land ownership adjustment plans to update lands desirable for acquisition and available for disposal

Trend Analysis 1986 through 2010

Existing land ownership adjustment plans have been reviewed and updated since the Forest Plan was adopted in 1986. Due to these adjustments substantial progress has been made as thousands of acres of land have been added to the Coronado NF through the land exchange program. For example, over 5,000 acres of the Catalina State Park in the Santa Catalina Mountains and about 4,200 acres in the Greaterville area of the Santa Rita Mountains have been acquired. Private development is no longer a threat to these lands and they are now available for multiple use purposes.

Need for Change Recommendation

The revised Forest Plan should provide management direction that encourages resolving the dilemma of areas within the Coronado boundary becoming land-locked by management practices on surrounding land in other ownerships (lands in State and private ownership).

The revised Forest Plan should provide management direction that addresses additional land acquisition, particularly where acquisition increases administrative and public access or relieves the problem of National Forest System lands being land-locked by development on adjacent private land.

Issue 2: Allocation of national forest land for special uses such as commercial development, summer homes, utility corridors, scientific study sites, roads, apiary sites, ski areas, etc.

Trend Analysis 1986 through 2010

The Coronado has received requests for special use authorizations, mainly of the recreation type (recreation events and outfitter/guiding), as well as a large increase in requests for research authorizations since the Forest Plan was adopted in 1986. Requests for land use permits have increased somewhat concomitantly with population growth as private lands are

developed and infrastructure needs (utility corridors) to service these developments increase. The Coronado has also experienced increases in requests for communication sites, primarily cellular telephone tower sites and infrastructure to support security needs along the international border with the Republic of Mexico.

Need for Change Recommendation

There is a need to increase use of authorities that provide additional funding for special uses through implementing cost recovery, particularly for lands special use permits.

Change is needed in the management and monitoring of recreation special uses in light of the increasing trend for new permit requests. Additionally, funding strategies should be developed to address the need to undertake capacity studies of recreation, a process that could provide the documentation needed to evaluate additional permits in overused areas.

Issue 3: Management of national forest land for astrophysical research purposes on Mount Graham.

Trend Analysis 1986 through 2010

Forest Plan Amendment 4 revised management direction for the Pinaleno Mountains resulting from the environmental study and decisions for the Mount Graham Astrophysical Area. The Mount Graham International Observatory complex, located on Mount Graham in the Pinaleño Mountain Range, has been administered under a special use permit since adoption of those decisions. Challenges have occurred with administration, but for the most part the operation has stayed within the area designated by the 1988 Arizona/Idaho Conservation Act and approved in Amendment 4.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended at this time.

New Issues

The amount of time to process special use requests has doubled or even tripled; budget allocations are insufficient to meet environmental review and processing needs for these requests.

Special Area Designations

Coronado Forest Plan Special Area Designations Issues

1. Management of land as Zoological-Botanical Areas to protect biological uniqueness through modified management practices.
2. Management of land as Research Natural Areas to provide opportunities for study of natural ecological processes in undisturbed areas.

Issue 1: Management of land as Zoological-Botanical Areas to protect biological uniqueness through modified management practices.

Trend Analysis 1986 through 2010

Both South Fork of Cave Creek Zoological-Botanical Area and Guadalupe Canyon Zoological Area were established with the 1986 Forest Plan. Since then, four additional areas have been designated to enhance protection for biologically unique resources on the Forest.

In conjunction with a change in direction for Management Area 2 (through Forest Plan Amendment No. 4), a Mount Graham Red Squirrel Refugium was established in 1989 to provide opportunities for biological research while protecting the federally-endangered and Pinaleño Mountains-endemic Mount Graham Red Squirrel (*Tamiasciurus hudsonicus grahamensis*) and its associated spruce-fir habitat.

In 1998, Forest Plan Amendment No. 9 designated the Wet Canyon Talussnail area and created Management Area 2B for accompanying management direction. While not categorized specifically as a zoological area, this special area is designed to "...perpetuate the unique wildlife and vegetative species [of the area], in particular the Wet Canyon talussnail..."

The Wild Chile Botanical Area was established in 1999 through Forest Plan Change Notice 3, receiving the designation of Management Area 15 in the Forest Plan. The botanical area was established to protect the Nation's largest known population of a wild chile, known as the chiltepin (*Capsicum annuum* var. *glabriusculum*). This species is also identified on the Southwestern Regional Forester's Sensitive Species List, along with several other plants that share its habitat within the designated special area.

Most recently - on June 15th, 2011 - 680 acres of the Barfoot Park area in the Chiricahua Mountains was added to the system of National Natural Landmarks (NNLs), a collection of natural areas across the country that contain outstanding biological and geological resources, rarity, diversity, and value to science and education. The program is administered by the Department of Interior's National Park Service and is the only national program to recognize outstanding sites on both private and public lands. Barfoot Park NNL stands out for its unusual mix of Sierra Madrean and Rocky Mountain flora and fauna, more than 15 acres of talus slopes, three alpine meadows, and two permanent springs. It is one of 591 landmarks currently recognized within the system, and while it is not designated as a botanical or zoological area, NNLs meet a similar intent.

Need for Change Recommendation

No need for change in Forest Plan direction is recommended at this time.

Issue 2: Management of land as Research Natural Areas to provide opportunities for study of natural ecological processes in undisturbed areas.

Trend Analysis 1986 through 2010

There are six designated Research Natural Areas (RNAs) located on the Coronado NF: Santa Catalina, Pole Bridge, Butterfly Peak, Goodding, Goudy, and Elgin RNAs. Language within the 1986 Forest Plan and a 1987 amendment (No. 3) recommended expanding the Goodding RNA by 1470 acres and 153 acres, respectively. An extension to the Pole Bridge RNA was also recommended in the 1986 Forest Plan, as well as creation of a new Canelo RNA. To date, the recommended designation and extensions have not been approved by the Regional Forester and appropriate Research Station Director, although management of the areas remains consistent with RNA policy. Research Natural Areas provide opportunities for non-manipulative research.

In addition to study within RNAs, management direction for the Wet Canyon Talussnail area (Management Area 2B) encourages scientific investigation of talussnails within the Pinaleño Mountains. Further, monitoring and study of Mount Graham Red Squirrels and their habitat is provided for in Management Area 2A for the refugium.

Need for Change Recommendation

There is a need to review and finalize the proposed extensions to the Goodding and Pole Bridge RNAs, and the proposed designation of the Canelo RNA. However, this process requires action at higher levels of the Agency and cannot be addresses through Forest Plan revision.

New Issues

There are only three designated zoological and/or botanical areas on the Coronado NF; however, the number of other special area designations combines with these to formally protect a wealth of unique biological resources. Still, the internal and external public continues to express interest in protecting additional lands. New zoological and botanical area proposals should be vetted and potentially designated through the Forest Plan revision process and as work capacity permits once the revised plan is approved.

Members of the internal and external public have expressed interest in recognizing new areas for research, education, and protection through RNA designation. There is a need for Forest staff to evaluate proposals as they are submitted, and make recommendations for potential designation to the Regional Office and appropriate Research Station Director.

Protection

Coronado Forest Plan Protection Issues

1. Use of fire as a management tool including planned ignitions, prescribed natural fire, and management of wildfires
2. Appropriateness of suppression actions under varying conditions and locations

Issue 1: Use of fire as a management tool including planned ignitions, prescribed natural fire, and management of wildfires

Trend Analysis 1986 through 2010

The Forest Plan approved in 1986 reflected the Forest Service's fire management policy of its time, that is, suppression of all fires. Since the Forest Plan was approved, fire management policy has evolved. In August 2000, the Departments of Agriculture and Interior agreed on a National Fire Plan to govern interagency fire management. One component of the National Fire Plan is the 2001 Federal Wildland Fire Management Policy, which presents the option for agency managers to use wildland fire to achieve natural resource benefits in locations other than Wilderness, Wilderness Study Areas, and Research Natural Areas.

In 2005, the Forest Plan was amended (Amendment 11) to conform to the 2001 Federal Fire Policy and a Wildland Fire Policy allowing use of wildland fire for resource benefits on a Forestwide basis. Under this amendment, when a natural ignition occurs, an appropriate management response of either suppression or wildland fire use could be considered. This amendment changed management direction for goals and Forestwide standards and guidelines.

In 2008, the Wildland Fire Leadership Council agreed on modifying the guidance to the "Interagency Strategy for the Implementation of Federal Wildland Fire Management policy", contingent upon favorable counsel review. In 2009, as a result of the review, "Guidance for the Implementation of Federal Wildland Fire Management Policy" was approved. The revised guidance provides for flexibility in managing wildfires; it also provides broad authorities in development and use of wildfire objectives.

Ultimately, the revised policy brought about a shift in the Forest's response to wildfires, allowing fire managers to provide for multiple objectives when managing a fire. In order to effectively communicate this "shift" to our internal and external audiences, terminology updates were developed to help alleviate confusion in the field, with our cooperators and partners, and with the public.

Need for Change Recommendation

There is a need to ensure that Forest Plan content is consistent with the 2009 updated policy and to incorporate updated terminology into the plan during the revision process.

Issue 2: Appropriateness of suppression actions under varying conditions and locations

Trend Analysis 1986 through 2010

As fire policy has evolved, management of wildland fire has become more flexible, allowing managers to utilize a range of responses from aggressive suppression to monitoring fire growth. Response options are now based on ecological, social, and legal consequences of the fire. The circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and, values to be protected, dictate the appropriate response to the fire.

Additionally, regulations at Section 7 of the Endangered Species Act of 1973 apply to appropriate management responses. The regulations for implementing the Act call for expedited consultation during fire emergencies. Section 7 regulations recognize that an emergency (natural disaster or other calamity) may require expedited consultation (50 CFR 402.05). This applies to both wildland fire use and suppression appropriate management responses.

Need for Change Recommendation

Plan Amendment No. 11 incorporated guidance from the updated 2001 Federal Fire Policy. There is a need to incorporate additional updates to policy since the 2005 amendment into the revised Forest Plan.

New Issues

There is a need for change in the fuels management component of the Forest Plan. The following should be a guide to developing new management direction:

Fuels Management

- Losses of life are minimized, and firefighter injuries and damage to communities and the environment from severe, unplanned, and unwanted wildland fire are reduced
- Hazardous fuels are treated, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment
- Fire-adapted ecosystems are restored, rehabilitated, and maintained, using appropriate tools, in a manner that will provide sustainable environmental, social, and economic benefits
- Using prescribed fire and other fuels reduction tools to simultaneously meet long-term ecological, economic, and community objectives, actively provide for forest and rangeland management, including thinning that produces commercial or pre-commercial products, biomass removal, and utilization

Monitoring and Evaluation

- Establish a formal review process to monitor and evaluate performance, suggest revisions, and make necessary adaptations to the fire management strategy at all levels on a regular basis
- Integrate new information obtained from scientific research, as well as third-party review and analysis

Appropriate Tools

- Utilize methods for reducing hazardous fuels including prescribed fire (or planned ignitions), wildfire (unplanned fire ignitions), and various mechanical methods such as crushing, tractor and hand piling, thinning (to produce commercial or pre-commercial products), and pruning.
- Select methods on a site-specific basis that are ecologically appropriate and cost effective

Facilities (Roads and Trails)

Coronado Forest Plan Facilities (Roads and Trails) Issues

1. Need for adequate legal rights-of-way to allow public access to the national forest for all legal uses
2. Commitment of resources to construction and maintenance of an adequate system of roads and trails (including signing) for Forest users
3. Resolution of conflicts between trail users (hikers, horses, motorized vehicles)
4. Degree of public access to special use areas – involves a legitimate need to protect valuable improvements versus the public's right to access to public land

Issue 1: Need for adequate legal rights-of-way to allow public access to the national forest for all legal uses

Trend Analysis 1986 through 2010

The 1986 Forest Plan identified specific road and trail access points. However, it was vague with respect to specifying what steps were necessary to obtain permanent legal access.

The rapid growth of Arizona's population has led to a much greater demand for public access to National Forest System lands. At the same time, increased development of adjacent private lands has resulted in even greater restrictions to public access of these lands. Since the adoption of the 1986 Forest Plan, access has become an increasingly complicated problem due to blockage of access points to National Forest System lands by adjacent landowners and a reduction in the number of access points due to development on adjacent non-Forest lands.

For many years, private landowners informally permitted access via traditional travel routes across their land adjoining the Coronado National Forest. At that time, the Forest Service did not actively pursue legal access easements because landowners appeared willing to allow access through their property. Today, private landowners abutting the Coronado National Forest, especially those in the vicinity of the international border with the Republic of Mexico, are locking gates on their property that formerly allowed access to National Forest System lands. These formerly cooperative landowners must, in today's circumstances, place higher priority on addressing safety concerns associated with substantial increases in danger to their personal safety arising from the presence of drug smugglers carrying weapons, trash and human waste accumulations left in the wake of border crossings, and other illegal activities (car theft, home invasion, and drugs), to name a few. Illegal activities have also caused resource damage on and off National Forest System lands.

Due to traditional access points being blocked, National Forest System lands have, in some areas, essentially become National Forest "backyards" that provide exclusive or private access only to the adjacent landowners and their guests, without also providing benefit to the general public or access for administrative purposes.

Obtaining legal right-of-ways has taken years to complete in some cases. Many desirable access roads and trails identified in the 1986 Forest Plan still have not been obtained. Often, private landowners have not been willing to negotiate; with other government agency negotiations, projects have been delayed due to differing policies and regulations.

Only about one-third (approximately 100 of the 300) access points to the Coronado's approximately 1.2 million acres from outside its proclaimed boundaries have permanent legal access. In early 2005, a Forest Service position was staffed to assist with resolving priority public access needs. The Coronado NF continues to explore viable ways to obtain new public access or restore access to Forest lands. For instance, planning was completed in 2010 for the High Creek Access project, and exploration of potential routes continues for access to John Long Canyon, French Joe Canyon, and other areas.

Need for Change Recommendation

Emphasis and prioritization of public access efforts should be structured around public access needs to specific locations within or adjacent to Ecosystem Management Areas (EMAs). Decisions regarding emphasis and priorities should consider the concerns expressed by adjacent landowners, advocacy groups, as well as local, State, or Federal agency support of or opposition to public access to the area rather than identifying a specific individual access point or road within or to an EMA.

Flexibility, as well as a comprehensive, coordinated, and collaborative public access effort, is central to resolving many of the Forest's public access needs. Partnerships, relationships, and agreements with Federal, State, and local agencies, third parties, interested organizations and publics, and private landowners are essential to providing adequate permanent legal public access to the Coronado National Forest. Opportunities to work directly with partners to support and resolve public access needs should be actively encouraged. When public access to Forest lands is clearly needed or desired, and a collaborative approach with private landowners is not possible, unilateral USFS action may be necessary and desirable to obtain such access. For example, bypassing private inholdings by building roads or trails wholly on Forest lands can be an effective way of providing public access when landowner support is lacking.

Forestwide public access needs should be given greater emphasis where there is support from landowners, advocacy groups, or local, State, or Federal agencies to protect or obtain public access points and routes, or to restore access points and routes to areas that have lost public access, especially where partners are willing to donate or acquire a right-of-way on behalf of the United States and/or relocate, reconstruct, or construct a permanent legal public access point and route that meets Forestwide public access needs.

Issue 2: Commitment of resources to construction and maintenance of an adequate system of roads and trails (including signing) for Forest users

Trend Analysis 1986 through 2010

Generally, the extent and location of trails is adequate to meet Forest management goals and objectives. With few exceptions, there is relatively little need to construct new trails. However, reconstruction and relocation of existing trails is needed. Large wildfires during

the last 25 years have damaged many miles of trail and reconstruction of trails in these areas presents a continuing challenge. Overall, funding has not been adequate to maintain the existing trail system Forest-wide and some trails are in danger of being lost as a result.

Generally, the extent and location of roads is adequate to meet Forest management goals and objectives in areas where public access exists. Where public access is inadequate, newly constructed or reconstructed roads may be necessary; however these decisions are subsequent to determining access needs and analyzing potential solutions. While the extent of the road system is generally adequate, there has been a downward spiraling trend of insufficient funding to maintain the existing system. Travel Analysis has identified that the Coronado NF receives approximately 10% of the funding necessary to maintain its road system in a condition which meets standards and prevents, or periodically remedies, maintenance and wear needs. The result of past, ongoing and projected underfunding is that the condition—and very existence—of the majority of the roads on the Coronado National Forest is in jeopardy.

Need for Change Recommendation

There is a need to improve permanent legal public access to the road and trail system. Future right-of-way acquisition, land ownership adjustment, and landline location program management efforts should focus on providing permanent legal public road and trail access to and within National Forest System lands, as well as precluding exclusive or private access to National Forest System roads, trails, or lands from adjoining private lands.

There is also a need to increase the allocation and availability of funds for transportation system maintenance; both the road and trail system are severely degraded. If funding cannot be generated locally or regionally, and Forest System allocation from Congress is not increased, alternatives must be considered to ensure that available roads and trails do not becomes safety hazards to Forest personnel, public users, or the natural resources they affect. Alternatives could include:

- Reduce the miles of road on the Forest road system—particularly higher standard roads—through conversion of passenger car roads to high clearance vehicle roads, and/or elimination of roads for which the sosts exceed the benefits. This alternative must comply with the Travel Management Rule (TMR), which incorporates analysis criteria such as funding availability for maintenance.
- Reduce the miles of trail on the Forest trail system, subsequent to a visitor use and need analysis involving public collaboration.
- Transfer maintenance of road miles to another road management entity (e.g. County, State, private). This alternative necessitates that the receiving road management entity is willing to accept the maintenance responsibility for the road(s): a bilateral process that is hindered by other agency resistance.
- Grow and integrate the Forest's volunteer program to focus more efforts on trail maintenance.
- Explore other partnership opportunities to offset the cost of road and trail maintenance.

Issue 3: Resolution of conflicts between trail users (hikers, horses, motorized vehicles)

Trend Analysis 1986 through 2010

Resolution of road and trail use conflicts is decided on an area-by-area basis in light of the overall management direction for each Management Area. Public safety, protection of natural resources, and quality of the recreational experience are primary evaluation criteria. This normally results in one or more uses being eliminated or restricted for a given road or trail.

Conflicts between motorized and non-motorized users have increased over the past decade as off-highway vehicles (OHVs) have become more desirable to the general public; their popularity has been exacerbated by improvements in technology, affordability, and availability. The Travel Analysis process and implementation of the 2005 Travel Management Rule (TMR) has been, and continues to be, effective in addressing conflicting uses of roads and trails. Mainly, this has been accomplished by identifying and publicizing the system of roads and trails available for public use, including the use types allowed. The most recent amendment to the Forest Plan (Amendment No. 12 in August 2010) incorporated the TMR direction by removing language that allowed for motorized use on certain hiking trails, vehicular access to any area within 300 feet of roads for the purpose of parking and camping, and motorized travel on any roads not posted as closed. The language was replaced with the following direction: "*Motor vehicle use off the designated system of roads, trails, and areas is prohibited, except as identified on a Motor-Vehicle Use Map (MVUM).*" Continual updates to the MVUM, combined with other educational tools, should help to address many of the user conflicts occurring of Forest trails.

Still, user conflicts will occur on trails (and all areas) as the demand for recreational opportunities and other uses of Forest lands increases commensurate with increasing population growth.

Need for Change Recommendation

There have been no needs for change identified.

Issue 4: Degree of public access to special use areas – involves a legitimate need to protect valuable improvements versus the public's right to access to public land

Trend Analysis 1986 through 2010

The extent of public access to areas under special use authorizations is decided on a case-by-case basis. Permitted use varies. To alleviate safety or resource concerns, or to address other policy restrictions use in some areas may be restricted only to Forest Service personnel and permittees.

Special use authorization of some areas (e.g. Mt. Lemmon at Radar Base) conflicts with what would ordinarily be a publicly desirable location for recreation purposes.

Need for Change Recommendation

Once capacity studies for special uses are completed their results may limit the number of permittees authorized in certain areas. Restrictions to special use permit access will continue to vary across the Forest.

Existing use at Radar Base could be reconfigured to allow public access to Mt. Lemmon proper, given sufficient notice to the permittee(s). Alternatively a public/private venture at this location might provide additional recreation and business opportunities.

A change is highly desired at many special use areas served by a National Forest System Road. Most special use permits for electronic sites, observatories and some other uses have no provisions directly addressing the maintenance and liability considerations of the roadway which serves the site—even when the site and road exist entirely or predominantly for the benefit of the special use permittee. This existing condition leaves the Coronado in a position of liability—if not actual maintenance responsibility—which is unjust to the taxpayers and contrary to policy intent.

New Issues

Of particular concern are access challenges complicated by management of the international border with the Republic of Mexico – the current magnitude of these challenges could not be foreseen by the designers of the 1986 Forest Plan, and therefore the current Forest Plan contains no management direction specific to these needs.

A related issue is the ever-increasing motor-vehicle access required by Customs and Border Protection (CBP) on the Forest. In many areas, CBP access is incompatible with motorized access for the general public. These issues are currently being investigated and various solutions have been formally proposed internally and externally. The trend in CBP use has the additional effect of amplifying road wear on the Forest's road system. Through a formal agreement, CBP currently provides funding for USFS road maintenance to compensate for some of the increased maintenance needs, but there are limits to its extent. Santa Cruz and Cochise County road departments face a similar issue, and are engaging CBP in a collaborative relationship to reach a suitable agreement, however the process is far from complete. As a result CBP-used County roads are degrading quickly at a time when County road maintenance funds are particularly low. Many of these County roads are arterials which provide primary public access to Forest roads, making the issue critical for Forest management as well.

Law Enforcement

Issue: Degree of regulation of Forest users and identification of areas needing more intensive enforcement efforts

Trend Analysis 1986 through 2010

The primary law enforcement needs identified in the 1986 Forest Plan were for protection of Forest resources and Forest users. Since then, law enforcement priorities have expanded in response to several factors: (a) increasing population and urbanization in areas adjacent to National Forest System lands; (b) use of National Forest System lands for illicit drug activities; (c) proximity of the international boundary with the Republic of Mexico; (d) support for fire investigations and public and firefighter safety during wildfires; and (e) increasing off-highway vehicle use.

The breadth of issues faced by law enforcement officers prompted an increase in staffing in 1991. Shortly after that, budget restraints resulted in a reduction in law enforcement program on the Coronado National Forest. In 2005, the impacts to the Forest from the factors listed above were increasing, and subsequently, there was an increase in law enforcement officers to address the issues.

In 2006, in response to the exponential rise in resource impacts and safety issues due to the Coronado National Forest's contiguous international border with the Republic of Mexico, the Forest Service and other Federal land management agencies in the States of Arizona and New Mexico jointly developed a coordinated strategic plan with the U.S. Department of Homeland Security, that provides for increased patrols, road maintenance and improvement, and vehicle barriers. In 2008, the law enforcement program on the Forest increased to 16 law enforcement personnel.

Need for Change Recommendation

The revised Forest Plan should incorporate, to the greatest extent possible, the recommendations of the Border Strategy Plan jointly developed with the U.S. Border Patrol, especially those recommendations that facilitate increased funding to meet law enforcement needs, visitor and employee safety, and protection of Coronado National Forest lands and resources.

New Issues

- Illegal immigration resulting in wildfire, property damage, illegal occupancy, public and employee safety, and drug trafficking
- Forest resource damage from off road vehicle use
- Alcohol use and possession and use of illegal substances
- Unauthorized occupancy and use

Forest Plan Management Direction

Trend Analysis 1986 through 2010

Since the time of its signing, the 1986 Forest Plan has been adapted to meet changed circumstances, direction, and evolving Forest Service policy through incorporation of three (3) change notices and the adoption of twelve (12) amendments. The overall trend in amendments was to remove text that implied site-specific decisions, and to provide for additions to management direction (standards and guidelines), mainly in the form of Regionwide amendments for protection of Mexican spotted owl and northern goshawk. In addition, several new management areas were defined and fire management direction was modified to provide for consistency with national policy. The most recent amendment provided consistency with the 2005 Travel Management Rule.

Need for Change Recommendation

Current Forest Plan components include: (a) management direction in the forms of goals, objectives, standards, and guidelines; (b) management area direction (includes management emphasis and intensity, capability area types, management area description, management practices and activities, and standards and guidelines), (c) monitoring, and (d) special area designations.

The Forest Plan revision should incorporate updated plan components that are consistent with the governing regulation; any management direction that is not consistent with the governing regulation, and that cannot be updated for consistency, should be removed. New direction should be incorporated as appropriate to meet needs identified in this report and to respond to voiced concerns from resource specialists, other agencies, and the public. As part of the Forest Plan revision process, all Forest Plan management direction should be reviewed for relevance, usefulness, and consistency with the governing planning regulations.

New Issues

In the time since the 1986 Forest Plan was adopted, Forest Service policy and procedures have been evolving and, in some cases are being shaped by forces outside Forest Service control, including changes in statutes, regulations, Executive Orders, and judicial oversight in the form of rulings, orders, and case law. Procedures and processes for analyzing land and resource use and management and developing documentation for forest planning are all, at times, affected by this evolution and change.

Outputs

Trend Analysis 1986 through 2010

Management direction in the 1986 Forest Plan, in many cases identified schedules of outputs for goods and services derived from management of Coronado National Forest lands and resources. Through time, most of these output schedules proved unrealistic from an implementation-feasibility or funding standpoint and were removed from the Forest Plan through change notices and amendments.

Need for Change Recommendation

The Forest Plan revision should incorporate updated management direction consistent with the governing regulation. As part of the Forest Plan revision process, all Forest Plan management direction regarding the scheduling of production outputs should be reviewed for relevance, usefulness, and consistency with the governing planning regulations.

New Issues

In the time since the 1986 Forest Plan was adopted, Forest Service policy and procedures have been evolving and, in some cases are being shaped by forces outside Forest Service control, including changes in statutes, regulations, Executive Orders, and judicial oversight in the form of rulings, orders, and case law. Procedures and processes for analyzing land and resource use and management including whether or not to emphasize the production of outputs are all, at times, affected by this evolution and change.

Insect and Disease Management

Trend Analysis 1986 through 2010

This discussion includes available information regarding insect activity on the Coronado NF for the period of scientific record. While the majority of our knowledge comes from study in the Pinaleño Mountains on the Safford Ranger District, observations from this range likely apply to most of the sky island mountain ranges based on similar climatic and ecological factors.

Contemporary insect activity on the Coronado NF is remarkable for the multitude of insect species incurring outbreaks, the severity of damage, the appearance of new species as pests, and the temperature-sensitive population dynamics of several species. Nine species have incurred severe and/or unprecedented outbreaks in the last 20 years. Other damaging insects and pathogens have been active as well, especially after fire events and during drought years.

The largest area damaged occurred in the pine type during the drought of the late 1900s and early 2000s from various pine bark beetles (mostly western pine beetle and roundheaded pine beetle (WPB and RHPB, respectively)), though the affected area is smaller than that damaged during the 1950s drought. Pine bark beetle activity is a normal consequence of drought, but damage to Chihuahua pine was unusually severe and was caused by the smaller Mexican pine beetle (XPB) and southern pine beetle (SPB). The 2000-2001 outbreak that damaged over 12,000 acres represents a range expansion for XPB and an unprecedented outbreak (in southern Arizona) for SPB. Both species have the potential to become more serious disturbance agents in Arizona, especially under warmer climatic scenarios. Pine bark beetle activity has been endemic in recent years, but will undoubtedly increase when drought conditions return.

Insect damage has been most severe in the Pinaleño spruce-fir type (87% mortality), and has been significant to Engelmann spruce and corkbark fir in the mixed-conifer as well (62% mortality of Engelmann spruce and 30% mortality to corkbark fir for the Safford R.D.). This damage considerably affected Mount Graham red squirrel habitat. Mortality can be attributed to the combined effects of Janet's looper, spruce beetle (SB), western balsam bark beetle (WBBB), and spruce aphid. Janet's looper, a previously obscure, innocuous species with no record of significant damage anywhere, completely defoliated about two-thirds of the Pinaleño spruce-fir forest in 1997-1999, as well as much of the spruce-fir in the White Mountains. This outbreak was followed by (and in part responsible for initiating) SB and WBBB outbreaks. Near the end of the Janet's looper outbreak, spruce aphid (an exotic) became established in the Pinaleños and eventually in the Chiricahuas. In the mixed-conifer, *Armillaria* root disease has been unusually active in drought- and insect-damaged areas. Since at least 1989 mountain pine beetle (MPB) has been killing small patches of southwestern white pine in the mixed-conifer forest; though mortality each year is small, cumulative effects have been significant. MPB is rare in the sky islands, and this outbreak is unprecedented. Population dynamics of SB, WBBB, spruce aphid, and MPB are enhanced during warm periods, and the Janet's looper outbreak occurred during years with very warm late autumn-early winter temperatures. Both Janet's looper and spruce aphid are winter-

feeding insects, and except for February 2011, winter-minimum temperatures have been relatively warm. The WBBB outbreak was more aggressive than the literature indicates is normal for this species.

Insect activity reported in Annual Conditions Reports is based mostly on aerial detection surveys flown annually in July and August. Damage may be underestimated because the sky island forests are particularly difficult to survey, as optimal timing coincides with monsoonal storms, particularly in the highest elevation forests.

Associations with Climate

Pine bark beetle damage in the late 1990s and early 2000s is drought-associated bark beetle activity, and coincides with the regional trend at that time. Several insect species that incurred recent outbreaks in the Pinaleños and Chiricahuas have outbreak dynamics that are known to be associated with periods of warm temperature. The appearance of new pest species also appears to be associated with warmer temperature regimes.

The implications of the disturbance event in the Pinaleño-spruce fir may easily be underestimated, as the area affected is relatively small; however, it represents 100% of the type on the Coronado NF. The severity of damage is at least as great as what has occurred in the Kenai Peninsula from SB and in western Canada from MPB, and resulted from outbreaks of four insect species, not just one. This comparison suggests that high elevation forests at low latitude may be particularly sensitive to climate change.

Need for Change Recommendation

The concept of climate change was not considered in the 1986 Forest Plan. However, even in the face of uncertainty regarding future climate and insect activity, general management recommendations for reducing susceptibility and vulnerability to insect outbreaks remain the same: improve tree vigor and maintain forest health by maintaining natural species, size, and age class distributions.

The aerial detection surveys, from which the conditions reports are compiled, map activity each year. Some of the same acres may be mapped in consecutive years for the same damage agent, usually indicating that the insect outbreak attacks more trees on the same sites in subsequent years, as well as the outbreak expanding to additional areas. A geospatial mapping based analysis would account for some of this overlap, but maps are not available for the entire record. Such maps should be compiled.

A survey conducted earlier in the season might detect additional pine bark beetle activity. The timing of pine tree crown fading should be investigated to determine if the historic time frame is best for insect detection surveys in southern Arizona.

New Issues

It would not be prudent to expect the next 10 or 20 years to be similar to the 1970s and 1980s with regard to insect activity. Contemporary trends are very different from historic trends, and altered ecosystem processes should be anticipated. The coincidental occurrence of competitive vegetation densities, drought, and warm climate has increased forest vulnerability to herbivorous insects, especially bark beetles. There is potential for

catastrophic insect outbreaks in the pine and mixed-conifer forests, but it is difficult to characterize the risks in a temporal framework. New species may become pests, through range expansion, emergence of obscure species as pests, and the arrival of exotics; the nature and timing of such problems is inherently unpredictable. There is a need to provide an adaptive framework for managing new and ongoing insect and disease outbreaks, and to consider the dynamic role of climate variability in exacerbating the effects and extent of outbreaks.

Literature Cited

Arizona Game and Fish Department. 2001. Gila topminnow. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 7pp.

Arizona Game and Fish Department. 2008. Hunt Arizona 2008: Hunt, Survey and Draw Data. Phoenix, AZ.

Devers, P.K. 1999. Public attitudes, wildlife and recreation management in Pusch Ridge Wilderness, Arizona. Masters thesis, University of Arizona, Tucson, AZ.

Hall, Linnea Suzanne. 1996. Habitat selection by the elegant trogon *(Trogon elegans)* at multiple scales. PhD Dissertation, University of Arizona. Tucson, Arizona. 181pp.

Schoenecker, K.A. 1997. Human disturbance in bighorn sheep habitat, Pusch Ridge Wilderness, Arizona. Thesis, University of Arizona, Tucson, AZ.

Harris, L.K. 1992. Recreation in mountain sheep habitat. Thesis, University of Arizona, Tucson, AZ.

Heffelfinger, J., B. Wakeling, J. Millican, S. Stone, T. Skinner, M. Fredlake and M. Adkins. 2000. Southeastern Arizona turkey management plan. Arizona Game and Fish Department. Phoenix AZ.

Stefferud, J.A. 2001. Redrock Canyon photopoint and aquatic habitat survey. Sierra Vista Ranger District, Coronado National Forest, Santa Cruz Co. USDA Forest Service, Tonto National Forest, Phoenix.

Stefferud, J.A. and S.E. Stefferud. 2004. Aquatic and riparian surveys of selected stream courses on Sierra Vista and Nogales Ranger Districts, Coronado National Forest, Cochise and Santa Cruz Counties, Arizona. Final Report to US forest Service, Agreement 11CS110305-17-032. Arizona State University, Tempe.

USDA Forest Service. 1986. Coronado National Forest Land and Resource Management Plan. Southwest Region. Albuquerque, NM.

USDA Forest Service. 2006. Coronado National Forest Management Indicator Species population status and trends: 1986-2006. Tucson, AZ. (http://www.fs.fed.us/r3/coronado/)

USDA Forest Service. 2008. National Visitor Use Monitoring Results: Coronado National Forest, October 2008, Data Collected FY2011 and FY 2007. On file at: Coronado National Forest Supervisor's Office, Tucson, AZ. 80 pp.

USDA Forest Service. 2010. National Visitor Use Monitoring Results, National Summary Report: Data collected FY 2005 through FY 2009. Available at: http://www.fs.fed.us/recreation/programs/nvum/. 32 pp.

Appendix: Management Indicator Species Status Report 2011

CORONADO NATIONAL FOREST MANAGEMENT INDICATOR SPECIES POPULATION STATUS AND TRENDS

United States Department of Agriculture
Forest Service – Southwestern Region
Coronado National Forest

TABLE OF CONTENTS

Introduction **4**
Regulatory Context 4
Management Indicator Species Selection 4
Occupied habitats. 8
Monitoring requirements. 9
MIS/habitat relationships. 9
Monitoring ..... Error! Bookmark not defined.
Standards and Guidelines. 9
Population viability 10
Species Evaluations **12**
Birds 13
Elegant Trogon (*Trogon elegans*) 13
Sulphur-bellied Flycatcher (*Myiodynastes luteiventris*). 16
Other Primary and Secondary Cavity Nesters. 18
Northern Gray Hawk (*Asturina nitida maxima*) 20
Blue-throated hummingbird (*Lampornis clemenciae*). 22
Rose-throated Becard (*Pachyramphus aglaiae*) 23
Thick-billed Kingbird (*Tyrannus crassirostris*). 24
Northern Beardless Tyrannulet (*Camptostoma imberbe*) 26
Bell's vireo (Vireo bellii) 28
Merriam's Turkey (*Meleagris gallopavo merriami*). 30
Gould's Turkey (*Meleagris gallopavo mexicana*) 32
Buff-breasted Flycatcher (*Empidonax fulvifrons*) 34
Montezuma (Mearns') Quail (*Cyrtonyx montezumae mearnsi*) 37
Baird's Sparrow (*Ammodramus bairdii*) 41
American Peregrine Falcon (*Falco peregrinus anatum*) 43
Five-striped sparrow (Aimophila quinquestriata) 45
Mammals 47
Black Bear (*Ursus americanus*) 47
White-tailed Deer (*Odocoileus virginianus couesi*). 49
Revised and updated: July 2004Pronghorn Antelope (*Antilocapra americana*) 51
Pronghorn Antelope (*Antilocapra americana*) 52
Desert Bighorn Sheep (*Ovis Canadensis deserti*) 54
Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) 56
Reptiles 59
Desert massassauga (*Sistrurus catenatus edwardsii*) 59
Arizona Ridge-nosed Rattlesnake (*Crotalus willardi willardi*) 60
Twin-spotted Rattlesnake (*Crotalus pricei*) 62
Amphibians 63
Western Barking Frog (*Eleutherodactylus augusti cactorum*) 63
Mountain Tree Frog (*Hyla wrightorum*) 64
Sonora Tiger Salamander (*Ambystoma tigrinum stebbinsi*) 66
Tarahumara frog (*Rana tarahumarae*) 68
Fish 70

Mexican stoneroller (*Campostoma ornatum*) 70
Apache (Arizona) trout (*Oncorhynchus apache*) 72
Gila topminnow (*Poeciliopsis occidentalis occidentalis*) 73
Gila chub (*Gila intermedia*) 75
Sonora chub (*Gila ditaenia*) 76
Spikedace (*Meda fulgida*) 78
LITERATURE CITED **79**

Introduction
Regulatory Context

The role of management indicator species (MIS) in National Forest planning is described in the 1982 implementing regulations for the National Forest Management Act (NFMA) of 1976. These regulations require that certain vertebrate and/or invertebrate species present in the area be identified as MIS and that they be selected because "*their population changes are believed to indicate the effects of management activities*" (36 CFR 219.19(a)(1).

The Forest Service Manual (FSM) defines management indicators as "*Plant and animal species, communities or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent.*" (FSM 2620.5).

The NFMA regulations identify five categories of species that may be considered, where appropriate, as management indicator species:

- *Endangered and threatened plant and animal species identified on State and Federal lists for the area.*
- *Species with special habitat needs that may be influenced significantly by planned management programs.*
- *Species commonly hunted, fished or trapped*
- *Nongame species of special interest*
- *Plant and animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality.*

Section 219.19(a)(6) requires that "*Population trends of the management indicator species will be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with State fish and wildlife agencies to the extent practicable.*"

In order to meet the spirit and intent of the planning regulations, thirty-three Management Indicator Species and one group - primary and secondary cavity nesters - in eight indicator groups were identified in the Coronado National Forest Land and Resource Management Plan adopted in 1986 (U.S. Forest Service 1986: 128-129). The sections of this document that follow describe the process for selection of MIS on the Coronado National Forest (CNF), summarize monitoring information for these species and, where possible, asses their status and utility as MIS after 16 years of Forest Plan implementation. Species accounts are updated periodically as additional monitoring information becomes available.

Management Indicator Species Selection

The Coronado National Forest Land and Resource Management Plan (Forest Plan) was adopted in 1986. The process for selecting management indicator species is described in the Wildlife and Fish chapter of the Coronado National Forest Analysis of the Management Situation (USFS 1982) on file in the Coronado National Forest Supervisor's Office. Table 1 and Table 2 display management indicator species by indicator group. According to the records on file, only a single species – Bell's vireo – and cavity nesters as a group were considered suitable for selection as

indicators whose population changes could be used to indicate the effects of management on other species. The remaining 32 species were selected largely because they had identifiable special habitat needs, but were not considered suitable for tracking Forest-wide habitat conditions. Indeed, many species had very narrow habitat tolerances or occur over a very restricted range on the Forest. Each of the 5 categories of MIS described in the MFMA regulations (above) is represented in the Forest Plan list.

Management indicator species are displayed in the Forest Plan in 8 indicator groups (Table 1); however, there is no information in the planning records to indicate how the 8 groups were derived. The indicator groups themselves are general descriptions of a desired condition (diversity, riparian, dense canopy, etc.) but are not statements of a quantifiable plant community or habitat type identified in the Forest Plan. Several species occur in more than one group (Table 2). For example, Elegant Trogons are included in the Cavity Nesters, Riparian Species, Species Needing Diversity, Special Interest and Threatened and Endangered Species groups.

Table 1. Coronado National Forest Management Indicator Species by Group

	Group	Species
1	Cavity Nesters	Coppery-tailed (Elegant) Trogon Sulphur-bellied Flycatcher Other primary and secondary cavity nesters*
2	Riparian Species	Gray hawk Blue-throated hummingbird Coppery-tailed (elegant) trogon Rose-throated becard Thick-billed kingbird Sulphur-bellied flycatcher Northern Beardless tyrannulet Bell's vireo Black bear
3	Species Needing Diversity	White-tailed deer Merriam's turkey Coppery-tailed (elegant) trogon Sulphur-bellied flycatcher Buff-breasted flycatcher Black bear
4	Species Needing Herbaceous Cover	White-tailed deer Mearn's quail Pronghorn antelope Desert massassauga Baird's sparrow
5	Species Needing Dense Canopy	Bell's vireo Northern beardless tyrannulet Gray hawk
6	Game Species	White-tailed deer Mearn's quail Pronghorn antelope Desert bighorn sheep Merriam's turkey Black bear
7	Special Interest Species	Mearn's quail Gray hawk Blue-throated hummingbird

	Group	Species
		Coppery-tailed (elegant) trogon Rose-throated becard Thick-billed kingbird Sulphur-bellied flycatcher Buff-breasted flycatcher Northern beardless tyrannulet Five-striped sparrow
8	Threatened and Endangered Species	Desert bighorn sheep Gray hawk Peregrine falcon Blue-throated hummingbird Coppery-tailed (Elegant) trogon Rose-throated becard Thick-billed kingbird Sulphur-bellied flycatcher Buff-breasted flycatcher Northern beardless tyrannulet Bell's vireo Baird's sparrow Five-striped sparrow Mexican stoneroller Arizona (Apache) trout Gila topminnow Gila chub Sonora chub Desert massassauga Twin-spotted rattlesnake Arizona ridge-nosed rattlesnake Huachuca (Sonora) tiger salamander Tarahumara frog Western barking frog Spikedace Arizona treefrog Mt. Graham spruce (red) squirrel Gould's turkey

**Primary Cavity Nesters*

Ladder-backed woodpecker, Arizona woodpecker, northern flicker, Gila woodpecker, acorn woodpecker, hairy woodpecker

**Secondary Cavity Nesters*

American kestrel, elf owl, flammulated owl, whiskered screech owl, western screech owl, Northern pygmy-owl, Mexican spotted owl, elegant trogon, eared trogon, Sulphur-bellied flycatcher, brown-crested flycatcher, ash-throated flycatcher, dusky capped flycatcher, Cordilleran flycatcher, violet green swallow, juniper titmouse, bridled titmouse, brown creeper, white-breasted nuthatch, red-breasted nuthatch, pygmy nuthatch, house wren, Bewick's wren, eastern bluebird, European starling, Lucy's warbler.

Table 2. Coronado National Forest Management Indicator Species and Indicator Categories

Indicator Species	Cavity Nesters	Riparian Species	Species needing Diversity	Species Needing Herbaceous Cover	Species Needing Dense Canopy	Game Species	Special Interest Species	T&E Species
Desert Bighorn Sheep						X		X
Pronghorn antelope				X		X		
Mt. Graham Red Squirrel								X
White-tailed deer			X	X		X		
Black bear		X	X			X		
Elegant trogon	X	X	X				X	X
Sulphur-bellied flycatcher	X	X	X				X	X
Gray hawk		X			X		X	X
Blue-throated hummingbird		X					X	X
Rose-throated becard		X					X	X
Thick-billed kingbird		X					X	X
Northern beardless tyrannulet		X			X		X	X
Bell's vireo		X			X			X
Buff-breasted flycatcher			X				X	X
Mearns' quail				X		X	X	
Merriam's turkey			X			X		
Five-striped sparrow							X	X
Peregrine falcon								X
Baird's sparrow				X				X
Gould's turkey								X
Primary and secondary cavity nesters	X							
Desert Massassauga				X				X
Twin-spotted rattlesnake								X
Arizona ridge-nosed rattlesnake								X
Huachuca (Sonora) tiger salamander								X
Tarahumara frog								X
Western barking frog								X
Arizona treefrog								X
Mexican stoneroller								X
Arizona (Apache) trout								X
Gila topminnow								X
Gila chub								X
Sonora chub								X
Spikedace								X

Occupied habitats.

Occupied habitat was defined in the Analysis of the Management Situation (AMS) as habitat necessary for the survival of the species at the time the Forest Plan was adopted. Estimates of occupied habitats were derived from estimates provided by the Arizona and New Mexico Natural Heritage Programs and from the game and fish agencies of the respective states. Estimates of occupied habitats were not available for all MIS (Table 3). For most species, occupied habitats were broken out by vegetation types. This will be described in greater detail in the individual accounts for each MIS.

Table 3. Minimum habitat estimates for management indicator species from the Coronado National Forest Land and Resource Management Plan, 1986.

Indicator Species	Acres or Miles of Occupied Habitat
White-tailed deer	1,430,071
Montezuma (Mearns') quail	225,410
Pronghorn Antelope	57,692
Desert bighorn sheep	72,468
Merriam's turkey	422,901
Gray Hawk	567
Peregrine falcon	No data
Blue-throated hummingbird	No data
Elegant (Coppery-tailed) trogon	12,190
Rose-throated becard	752
Thick-billed kingbird	1,200
Sulphur-bellied flycatcher	No data
Buff-breasted flycatcher	90
Northern beardless tyrannulet	1,270
Baird's sparrow	No data
Five-striped sparrow	18,279
Bell's vireo	No data
Desert massassauga	389
Arizona ridge-nosed rattlesnake	28,175
Twin-spotted rattlesnake	46,351
Huachuca tiger salamander	640
Tarahumara frog	1,339
Western barking frog	891
Mexican stoneroller	3.3 miles
Apache (Arizona) trout	19.6 miles
Gila topminnow	4.5 miles
Gila chub	4.4 miles
Sonora chub	3.7 miles
Spikedace	No data
Arizona treefrog	No data
Mount Graham red (spruce) squirrel	2,603
Black bear	641,113
Gould's turkey	No data

Monitoring requirements.

The Forest Plan monitoring requirements for MIS are displayed in Appendix 1. Only 8 species are specifically identified in the monitoring methods section and 6 of these are the game species listed in Group 5 (Table 1). The plan indicates that monitoring of MIS will be accomplished using third party data, especially Arizona Game and Fish Department (AGFD) survey data. This is consistent with the direction set out in Section 219 of NFMA. The bulk of costs noted for MIS monitoring were earmarked for research into the population/habitat relationships for MIS. The AMS emphasized that basic habitat and distribution data were lacking for many of the MIS on the Forest and that MIS monitoring should be focused on the development of baseline inventories for many species (USFS 1982). In the 16 years since the Forest Plan was adopted, the CNF has supported numerous studies aimed at achieving this objective. These are described in the individual species evaluations that follow.

MIS/habitat relationships.

Not all of the species selected in 1986 have utility as MIS. First, some of the selected MIS do not actually occur on the CNF or occur too infrequently to be reliable indicators for the habitats they were selected to represent. Some species occur marginally or seasonally on the Forest, but their populations are influenced significantly by habitat conditions in other parts of their ranges well off of the Forest. Some species have very narrow habitat preferences unique to that species, but the habitats themselves are not affected by management. Still other species have proven to be simply impractical to monitor and others are poor indicators of the effects of management on the Forest.

For species with populations of sufficient size and distribution, or for which significant effort has gone into population monitoring, population trends can be determined or inferred. However, the information has limited usefulness for management because the observed population changes can not be conclusively related to management actions and effects. Nevertheless, monitoring of most species has occurred over the years and research into population/habitat relationships has continued.

Standards and Guidelines.

Applicable Forest Plan standards and guidelines MIS forest-wide are displayed below:

1. *Maintain or improve occupied habitat of commonly hunted species, listed threatened or endangered species, and management indicator species through mitigation of Forest activities with cooperation of New Mexico Department of Game and Fish, Arizona Game and Fish Department, and US Fish and Wildlife Service.* (page 31-1).

11. *Evaluate through consultation with Arizona Game and Fish, New Mexico Departments of Game and Fish and Natural Resources, along with other wildlife and plan-oriented groups where appropriate, population viability of Management Indicator Species through determination of: (1) amount of suitable habitat; (2) distribution of suitable habitat; (3) number of individuals that support regional population goals; and (4) likelihood of continued existence.* (page 32).

In addition, management prescriptions for each management area on the Forest direct the Forest to "*maintain or improve current levels of occupied habitats*" for MIS appropriate to that management area (USFS 1986).

Population viability

The Committee of Scientists (COS) report (1999) defined a viable species as consisting of self-sustaining populations that are well distributed throughout the species range. Self-sustaining populations are those that are sufficiently abundant and have sufficient genetic diversity to provide for their persistence and adaptability in the planning area over time. The COS report described an assessment approach using four possible outcomes to be used in viability analysis in forest planning. The four outcomes are described as:

Outcome A: Habitat is of sufficient quality, distribution and abundance to allow the species population to stabilize and be well distributed across federal lands.

Outcome B: Habitat is of sufficient quality, distribution and abundance to allow the species population to stabilize, but with significant gaps in the historic species distribution on federal land. These gaps cause some limitations in interactions among local populations.

Outcome C: Habitat only allows continued species existence in refugia with strong limitations on interactions among local populations.

Outcome D: Habitat conditions result in species extirpation from federal land.

Within occupied habitats, wildlife species populations can fluctuate over time in response to a variety of environmental or management-related influences. This phenomenon is more pronounced for species at the margins of their distributional ranges. The majority of the MIS on the CNF are species at the margins of their ranges. As metapopulations expand and contract in response to changing environmental conditions, smaller subpopulations can become isolated and therefore more susceptible to stochastic events that serve to reduce or eliminate that population. Many of the MIS on the Forest were selected *because* they had a very limited distribution on the CNF, so their populations will never be well distributed across federal lands. Therefore, this analysis will focus on the status and trends of occupied habitats for the species on the CNF. Where possible, populations will be related on one of the possible outcomes.

Unlike many forests within the National Forest System, the Coronado National Forest does not have an active timber program. Resource management activities that potentially affect MIS and their habitats are primarily related to recreation, livestock grazing and to some extent, special uses. While these activities potentially affect species and habitats through disturbance, short term changes in herbaceous vegetation and long term and subtle changes in soil condition, they rarely if ever result in large and rapid changes in habitat structure that occur as a result of timber harvest.

In the desert southwest, the primary influence on wildlife populations is often annual rainfall and its effect on forage production and cover. Therefore, an apparent population change for a particular species over time does not necessarily indicate a corresponding change in the amount of habitat for that species, but rather a short-term reduction in the carrying capacity of that

habitat. These natural fluctuations tend to mask the effects of management on MIS species and their habitats.

By far, the greatest changes in Forest habitats have been related to the effects of fires that have occurred throughout the Forest since 1986. Between 1982 and 2004, an estimated 353,220 acres of the Forest (approximately 20% of the Forest) have burned as a result of human-caused and natural fires (see following table).

Fire occurrence on the Coronado National Forest 1982-2003.

	TOTAL	
Lightning	# of Fires	Acres
Broadleaf Woodland (Evergreen)	464	39139.45
Chaparral	37	831.1
Coniferous Forest (mixed conifer)	189	1073.1
Coniferous Forest (spruce-fir)	12	6.9
Coniferous Forest (transition)	379	33923.9
Coniferous Riparian	1	320
Coniferous Woodland	67	2725.8
Deciduous Forest	0	0
Deciduous Riparian	20	1372
Desert Grassland	114	28550.4
Dry Desert Riparian	0	0
Higher Ecosystem Extension	8	23.55
Mountain Grassland/Meadow	3	0.3
Plains Grassland	11	607
Southwestern Desertscrub	87	28042.8
Total Lightning	**1392**	**136616.3**

Human	# of Fires	Acres
Broadleaf Woodland (Evergreen)	521	44319.55
Chaparral	11	110.4
Coniferous Forest (mixed conifer)	166	937.55
Coniferous Forest (spruce-fir)	1	0.5
Coniferous Forest (transition)	244	85804.2
Coniferous Riparian	1	0.1
Coniferous Woodland	32	1033.5
Deciduous Forest	2	0.4
Deciduous Riparian	43	718.65
Desert Grassland	84	3351.2
Dry Desert Riparian	2	80.1
Higher Ecosystem Extension	8	70.7
Mountain Grassland/Meadow	5	2.7
Plains Grassland	20	17481.55
Southwestern Desertscrub	101	32993.45
Total Human Caused	**1241**	**186904.55**

Total of all Fires and Acres	**2633**	**323520.85**

Species Evaluations

Species-by-species evaluations of the CNF management indicator species follow. To the extent possible, the evaluations: 1) describe the reasons a particular MIS was selected, 2) document the relationship between the MIS and the habitat or indicator group, 3) identify the methods used to monitor MIS populations and/or habitats, 4) describe trends in the MIS population, and 5) provide an evaluation of the utility or reliability of the MIS for the purpose for which it was selected.

Population status and trends for the species addressed in this report were evaluated based on the following sources: Arizona Game and Fish Department (AGFD) Heritage Data Management System (HDMS), North American Breeding Bird Survey (NABBS) data from 1980-2000 (U.S. Geological Survey web site http://www.mbr.nbs.gov/bbdbbs.html), Christmas Bird Count (CBC) data (http://www.audubon.org/bird/cbc/), the Arizona Partners in Flight Bird Conservation Plan (Latta, et al 1999), the Forest's report of MIS status and trends (USFS 2002) and supporting documentation on file in Forest Service offices, and a wide variety of other literature related to Arizona wildlife and habitat types. Much of it is derived from state, federal agencies, university studies and private individuals who have monitored MIS populations on the CNF. In many cases, the data come from monitoring efforts accomplished by CNF biologists.

Only monitoring for MIS is included in this report. Several other species are monitored on the CNF, primarily to fulfill the requirements of terms and conditions of a variety of Biological Opinions issued by the U.S. Fish and Wildlife Service. These activities are reported annually in the USFWS Monitoring Report. In addition, the Arizona and New Mexico Game and Fish Departments accomplish a variety of game species surveys on the forest on an annual basis.

Species are evaluated in a species-by-species manner rather than by indicator groups. The diversity of species within each indicator group is so great that no conclusions can be drawn for the group based on population performance for the individual species within the group.

Birds

Elegant Trogon (*Trogon elegans*)

Background. Identified as the Coppery-tailed trogon in the Forest Plan, this species is included in the Cavity Nesters, Riparian Species, Species Needing Diversity and the Special Interest Species indicator groups. The species was selected because it inhabits diverse sycamore riparian with free water available in summer and requires flicker-sized cavities for nesting. It is a secondary cavity nester. It is considered sensitive to concentrated recreation (USFS 1982). The relationships between this MIS and its habitats have been summarized by Kunzmann et al (1998). This species frequents mixed deciduous riparian bottoms in the pine-oak belt from 4,500 to 6,500 feet. Birds arrive in southeastern Arizona as early as April. This species often selects cavities in Arizona sycamores (*Platanus wrightii*) for nesting. Other nest trees include silver-leaf and Arizona white oak (*Quercus spp.*) and Apache Pine (*Pinus englemanii*) and Chihuahua pine (*Pinus leiophylla*). Eggs are laid in May and June. Elegant trogons forage by flycatching or gleaning invertebrates from vegetation. The species also uses available fruits from southwestern chokecherry, madrone (*Arbutus arizonica*), birchleaf buckthorn (*Rhamnus betulaefolia*), and Virginia creeper (*Parthenocissus inserta*). After fledgling of the young, most birds migrate south starting in August, although a few birds have over-wintered in selected sites (Hall 1996, Taylor 1994).

Table 4. Estimates of occupied habitat for Elegant trogon: 1986 Coronado National Forest Plan.

Vegetation Community	Habitat Acres
Chaparral	162
Broadleaf evergreen woodlands	8769
Coniferous woodlands	2249
Deciduous forests	132
Coniferous forest (transition)	878
Deciduous riparian	1963
Total	14,153

Population trends. Annual trogon surveys are accomplished in the Chiricahua Mountains. The number of pairs observed between 1991 and 1999 averaged 6.2 pairs with no discernable trend. The most recent Forest-wide survey data comes from Hall (1996) who studied trogons in all four mountain ranges in which they occur on the Forest. A comparison of her data with similar forest-wide data collected by Taylor between 1977 and 1982 is shown in Table 5. Morrison et al (1996) calculated relative abundance and density estimates for trogons in 6 mountain ranges on the CNF between 1993 and 1995 as part of a contract to establish sampling protocols for riparian bird species on the CNF. On a state scale, the species is uncommon or restricted with 21 to 50 occurrences and is fairly common in a rather restricted range within Arizona (Arizona Game and Fish 2001). Within the CNF, the species is limited in distribution by its selectivity for a certain riparian habitat type, which is itself limited to a handful of canyons on the Forest. The existing data indicate that populations have fluctuated somewhat within individual canyons, but that overall populations are apparently stable.

Table 5. Average number of trogons in 4 mountain ranges on the Coronado National Forest for 2 periods: 1977-1982 and 1993-1995 (Hall 1996).

Mountain Range	77-82 Average	93-95 Average
Atascosas	9	6
Chiricahuas	22	9
Huachucas	20	46
Santa Ritas	16	17
Totals	67	78

Habitat Trends. The Forest Plan identifies12,190 acres of occupied habitat for the Coronado National Forest, but the AMS identified 14,153 acres. The difference of 1,963 acres is the amount of deciduous riparian and appears to have been an omission in totaling acreage in the final plan (Table 4). Regardless, no significant changes in habitat quantity or quality have occurred within occupied riparian canyons, so the amount of occupied habitat is considered stable since 1986.

Evaluation. Because of the patchy nature of their preferred habitat, trogons will never be well distributed across the forest. Although habitats are well described in a qualitative sense, quantitative data on habitat parameters that affect occupancy or nesting success are lacking. Habitats are of sufficient quality and abundance to allow the species to persist in all historic habitats. Elegant trogon populations have persisted over the past 20 years within suitable habitats and monitoring has been sufficient to detect occupancy, if not population trends. The amount of occupied habitat for the species has not been recently quantified, but it appears to be similar to the amount identified in 1986. The species may be a reliable indicator of mixed deciduous sycamore riparian habitats; however, populations on the CNF are seasonal and at the northern extension of the species range. Thus, populations may be influenced by conditions off of the Forest in non-breeding areas or stochastic events (e.g. fires or floods) that result in significant changes in the species' numbers or amounts of habitat. The species is highly sought by bird watchers and subject to disturbance from this activity. However, populations have persisted in the face of annual disturbance.

Information Sources

Hall, Linnea Suzanne. 1996. Habitat selection by the elegant trogon *(Trogon elegans)* at multiple scales. PhD Dissertation, University of Arizona. Tucson, Arizona. 181pp.

Kunzmann, M.R. et al. 1998. Elegant trogon *(Trogon elegans). In* The Birds of North America, No. 357 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, Pennsylvania. 24 pp.

Morrison, M.L., R.W. Mannan, L.L. Christopherson, L.S. Hall, and J.A. Martin. 1996. Determining the status and trends of neotropical migrant bird populations in riparian vegetation in southeastern Arizona. Final Report. USFS-U of A Agreement No. CCS3-94-05-006. Tucson, Arizona.

Taylor, Richard Cachor. 1994. Trogons of the Arizona Borderlands. Treasure Chest Publications. Tucson, Arizona.

Revised: 5-2002 (RAG)
2-10-2005 (RAG)

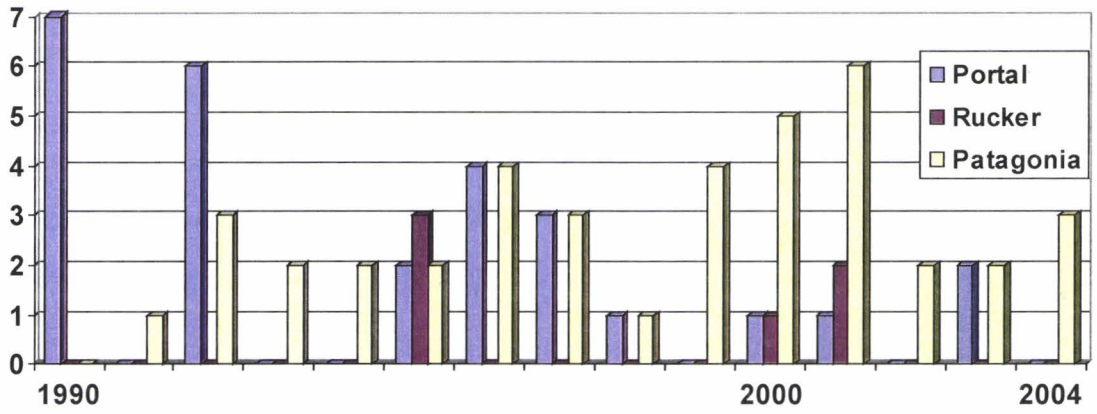
Sulphur-bellied Flycatcher (Myiodynastes luteiventris).

Background. This species is included in the Cavity Nesters, Riparian Species, Species Needing Diversity and Special Interest Species indicator groups. The species was selected because habitat requirements are "similar to Coppery-tailed Trogon (…Highly diverse riparian with free water available through the summer. Require flicker-sized cavities, primarily in sycamores, for nesting), but less susceptible to human disturbance". (USFS 1982).

Sulphur-bellied Flycatchers breed from extreme southeast Arizona south to Costa Rica. Within Arizona, they are summer residents in the Santa Rita, Huachuca and Chiricahua Mountains and rarely in the Santa Catalina and Pinaleno Mountains (Phillips et al 1964). They winter in South America in Peru and Bolivia. The species nests in mid-elevation (5,000-7,000 ft) mixed deciduous riparian canyons composed of Arizona Sycamore and Walnut (*Juglans major*). They build a nest of small sticks inside a cavity, usually in an Arizona Sycamore at a height between 20 and 50 feet above the ground (Scott et al 1977). They reside on the forest only during the nesting season, generally June-September.

Population trends. No organized surveys are conducted specifically for the species; however, they have been detected on breeding bird survey routes in Portal, Rucker and Patagonia on the Forest since 1986 (Sauer 2004). Figure 1 shows the number of birds detected on three survey routes between 1990 and 2004. The number of nesting birds fluctuates from year to year within individual canyons, but the Forest-wide total of birds detected has remained relatively stable.

Figure 1. Sulphur-bellied flycatcher occurrence in three Breeding Bird Survey routes on Coronado National Forest – 1990-2004.



On a global scale, the Sulphur-bellied flycatcher is considered demonstrably secure with over 100 occurrences. In Arizona, it is fairly common within a restricted range (AGFD 2001). Taylor (1995a,b) considered the species common in sycamore canyons along the U.S.-Mexico border, with up to 6 pairs per mile in suitable habitats in the Huachuca and Chiricahua Mountains. Morrison et al (1996) calculated relative abundance and density estimates for Sulphur-bellied flycatchers in 6 mountain ranges on the CNF between 1993 and 1995 as part of a contract to establish sampling protocols for riparian bird species on the CNF. Sulphur-bellied flycatchers are highly sought by birders, so even though there are no organized surveys, there is abundant anecdotal evidence every year on the status of birds on the forest.

Habitat trends. The CNF Plan gives no estimate of occupied habitat on the Forest. As noted above, the species' habitat preferences are similar to the Elegant trogon, so the amount of occupied habitat is considered similar as well. No significant changes in habitat quantity or quality have occurred within occupied riparian canyons, so the amount of occupied habitat is considered stable since 1986.

Evaluation. As with Elegant trogons, Sulphur-bellied flycatchers are highly selective for sycamore riparian habitats within the CNF and the distribution of the birds is restricted to available habitats. Habitats are of sufficient quality and abundance to allow populations of the species to persist in all suitable areas on the CNF. Monitoring has been sufficient to detect occupancy within known habitats. Populations appear stable, although a small sample size makes it difficult to detect trends. Because the CNF is at the far northern edge of the species' range and the bird occurs only seasonally on the Forest, conditions or events off of the Forest could effect the small breeding population on the Forest. These factors tend to impact the species value as a MIS on the Forest.

Information Sources

Arizona Game and Fish. 2001. *Myiodynastes luteiventris*. Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Morrison, M.L., R.W. Mannan, L.L. Christopherson, L.S. Hall, and J.A. Martin. 1996. Determining the status and trends of neotropical migrant bird populations in riparian vegetation in southeastern Arizona. Final Report. USFS-U of A Agreement No. CCS3-94-05-006. Tucson, Arizona.

Phillips, A., J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press. Tucson, Arizona.

Scott, V.E., K.E. Evans, D.R. Patton, and C.P. Stone. 1977. Cavity nesting birds of North American forests. U.S. Dep. Agric. Handb. 511, 112p.

Taylor, Richard Cachor. 1995a. A birder's guide to southeastern Arizona. American Birding Association, Inc. Colorado Springs, Colorado. 341pp.

Taylor, Richard Cachor. 1995b. Location checklist to the birds of the Huachuca Mountains and the upper San Pedro River. Borderland Productions. Tucson, Arizona. 48pp.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD*

Revised: 5-2002 (RAG)
2-10-2005 (RAG)

Other Primary and Secondary Cavity Nesters.

Primary cavity nesters are those species that excavate and nest in cavities, whereas secondary cavity nesters use cavities excavated by primary cavity nesters. On the Forest, cavity nesters occur primarily within forested areas including riparian habitats, Madrean evergreen woodlands, coniferous forests, and in Sonoran desert habitats that contain saguaro cactus (*Carniegia gigantea*). The LRMP did not quantify the amount of occupied habitat. At least 6 primary cavity nesters and approximately 30 secondary cavity nesters are found on the CNF. These are listed at the bottom of Table 1. In general, cavity nesters require large, older age class trees and snags to provide a suitable substrate for cavities. Although the species in this group specifically nest in cavities, some of them make use of many other habitats in completing their life cycles. For example, the American kestrel and eastern bluebird often forage in open grasslands (Ehrlich et al. 1988), and many members of the group winter in Mexico or Central America. The value of snags to cavity-nesting birds is widely recognized (Scott 1977). Many forest plans, including the Coronado's, included standards and guidelines for snag retention to provide cavity-nesting bird habitat.

Cavity nesters were selected as MIS because they were considered sensitive to fuelwood and timber harvest and watershed rehabilitation projects. (USFS 1982). Coronado Forest standards and guidelines call for retention of 100% of occupied cavity nester habitats outside of designated fuel wood harvest areas and 80% or more of occupied habitat within fuel wood stands. No standards exist for other vegetation communities.

Population trends. No monitoring of cavity nesting birds as a group occurs on the Forest. North American Breeding Bird Survey information for the Cavity Nester group in the Mexican Highlands physiographic region show slight but statistically insignificant declines for Ash-throated Flycatcher and Bewick's Wren (USGS 2004). The trend for the Ladder-back Woodpecker indicates a slight, but statistically insignificant increase. Trends for Elegant trogon and Sulphur-bellied flycatcher are described above. Several cavity nesting species are detected during annual breeding bird survey routes and trends for some of these are reported the U.S. Geological Survey. NABBS data for 1980-2003 in the Sierra madre Occidental Region show significant downward trends for Northern Flicker and American Kestrel (USGS 2004). For all other primary or secondary cavity nesters, trends were not significant or no data were available.

Habitat Trends. Since the Forest Plan was adopted in 1986, several large fires in the pine and mixed conifer plant communities have left thousands of dead standing trees in the Huachuca, Santa Catalina, Pinaleno and Chiricahua Mountains. In addition, insect infestations have resulted in the loss of thousands of acres of spruce-fir and mixed conifer trees on the Pinaleno Mountains. The result has been a substantial but unquantified increase in potential habitats (snags) for high elevation cavity-nesters.

Evaluation. As a group, cavity nesting birds share little in common except the tendency to build or use holes for nesting. Because of this diversity, no conclusions can be drawn regarding trends of cavity nesters in general. In general, habitat is considered to be of sufficient quality, distribution and abundance to allow cavity nesters to be well distributed across the Forest. As a group, cavity nesters habitat requirements are too broad to provide any meaningful interpretation of the effects of management on the group.

Information sources

Scott, V.E., K.E. Evans, D.R. Patton, and C.P. Stone. 1977. Cavity nesting birds of North American Forests. U.S. Dep. Agric. Handb. 511, 112p.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD*

Revised: 5-2002 (RAG)
2-10-2005 (RAG)

Northern Gray Hawk (*Asturina nitida maxima*)

Northern gray hawk is included in the Riparian Species, Species Needing Dense Canopy, and Special Interest Species indicator groups. The species was selected because of its need for "cottonwood and sycamore galleries with adjacent mesquite bosques or uplands". It was considered "sensitive to grazing, fuelwood harvest and concentrated recreation use such as off-road vehicles and campgrounds". The Analysis of the Management Situation (AMS) for the Forest Plan (USFS 1982) estimated the Forest-wide population as 2 breeding pairs and gave an estimate of 567 acres of occupied habitat (Table 6). It is also a Forest sensitive species.

Table 6. Estimated occupied habitat for Northern Gray Hawk in the 1986 Coronado National Forest Plan.

Vegetation Community	Habitat Acres
Desert grasslands	207
Broadleaf evergreen woodlands	180
Dry desert riparian	180
Total	567

This species generally prefers well-developed lower elevation deciduous riparian areas, specifically the tropical-subtropical riparian deciduous woodlands of mesquite (*Prosopis juliflora*) and hackberry (*Celtis reticulata*) bordering strands of cottonwood (*Populus fremontii*) and willow (*Salix goodingii*) (Glinski 1983). Sites on Forest also include more open stands of cottonwood, sycamore, and Madrean oaks with adjacent mesquite uplands (Tom Deecken, pers. obs.). Glinski (1983) identified the mix of woodland and thornscrub as important foraging habitats. Often surface water is nearby.

Population trends. Gray hawks nest in very low numbers on the CNF. No organized survey protocol is in place, but known nest sites are visited on an annual basis and nesting activity is reported. Between 1999 and 2005, an estimated 4-6 occupied nests were documented on the Nogales Ranger District (T. Newman, pers. comm.). Nesting activity is tracked through the Arizona Heritage Data Management System (HDMS). While the number of nesting birds is too small to make any meaningful assessment of population trend, it appears that the limited suitable habitat on the CNF is occupied and that more birds are nesting on the CNF than in 1986. On a statewide scale, Gray hawk numbers and their distribution have increased (Corman and Wise-Gervais 2005). Glinski (1998) estimated 80 breeding pairs of northern gray hawks in Arizona. On a global scale, the northern gray hawk is considered demonstrably secure with more than 100 occurrences.

Habitat trends. The background information for the Forest Plan does not indicate how the quantity of occupied habitat was derived, so it is difficult to determine changes in habitat quantity for the species. Based on the apparent increase in nesting birds on the Forest, habitat trends are presumed to be stable or improving.

Evaluation. Preferred habitats for northern gray hawks are generally found in lower elevation river valleys like the San Pedro River, Sonoita Creek and the Santa Cruz River. There is little potential for these types of habitats to exist on the CNF except in isolated pockets at lower elevations. However, where these habitats are found within the limited range of the species, gray hawks are nesting. Because of the limited numbers of gray hawks on the CNF and the limited

amount of capable habitat, the species is not well suited as a MIS, even though numbers are relatively easy to track. Habitats for the species are considered generally secure and are not affected by management activities. Monitoring should continue through HDMS.

Information sources.

Corman, T.E. and C. Wise-Gervaise. 2005. Arizona breeding Bird Atlas. Albuquerque: University of New Mexico Press.

Glinski, R.L. 1983. Gray hawk. In Proceedings of the southwest raptor management symposium and workshop. Tucson Arizona.

Glinski, Richard L. 1998. Gray hawk. Page 82-85 in The Raptors of Arizona (R.L. Glinski, ed.). The University of Arizona Press. Tucson, Arizona.

Revised: 5-2002 (RAG); 2-10-2005 (RAG); 5-10-2011 (RAG)

Blue-throated hummingbird (*Lampornis clemenciae*).

The Blue-throated hummingbird is included in the Riparian Species and Special Interest Species indicator groups. The species was selected as an indicator for the Forest Plan because of its relationship to riparian and grazing impacts (USFS 1982). The Forest Plan gives no data for acres of occupied habitat for the Coronado National Forest. The blue-throated hummingbird is found on the CNF during the spring and summer in wet pine-oak and oak canyons above 4,500 feet in elevation. Habitats within the CNF are at the very northern extreme of the species' range. It forages on the nectar of several species of flowers and also feeds on insects. It is highly tolerant of human activity and readily habituates to sugar water feeders.

Population trends. There are currently no systematic efforts to monitor populations. On a state scale, the species is apparently secure with more than 100 occurrences within Arizona (Arizona Game and Fish 2001d). Williamson (2000) described the population trend for the region as unknown, although she suggests that breeding populations may have increased in Arizona since the 1970's as a result of riparian improvement. Low numbers of birds are usually observed during NABBS routes in Rucker and Portal but data are insufficient to detect trends. Birds have also been recorded during the winter months, usually at hummingbird feeders. The species was observed on 5 of the last 6 Ramsey Canyon Christmas bird counts in the Huachuca Mountains. Numbers ranged from 1 to 3.

Habitat Trends. No quantitative data are available on habitat trends. However, since 1986, implementation of the Forest Plan has resulted in reductions in livestock grazing in most occupied riparian canyon habitats. Therefore, the amount of suitable habitat is not thought to have changed significantly since the mid-1980's.

Evaluation. The Blue-throated hummingbird has a very limited distribution on the Forest. The species is confined to a few montane canyons with running water at higher elevations. The limited available habitats are occupied and appear to be of sufficient quality and abundance to allow the species to persist in small numbers on the CNF. Very little grazing currently occurs in Blue-throated hummingbird habitat, so habitats are considered secure in that regard. Because populations are restricted to a few high elevation moist canyons, fires or other catastrophic events could affect or eliminate local populations. Because of its limited distribution and the current lack of threats to occupied habitats, the species is of limited utility as a MIS.

Information sources.

Taylor, Richard Cachor. 1995a. A birder's guide to southeastern Arizona. American Birding Association, Inc. Colorado Springs, Colorado. 341pp.

Taylor, Richard Cachor. 1995b. Location checklist to the birds of the Huachuca Mountains and the upper San Pedro River. Borderland Productions. Tucson, Arizona. 48pp.

Arizona Game and Fish. 2001d. *Lampornis clemenciae*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona.

Revised: 5-2002 (RAG); 2-10-2005 (RAG)

Rose-throated Becard (*Pachyramphus aglaiae*)

Rose-throated becard is included in the Riparian Species and Special Interest Species indicator groups. The species was selected because of its dependence on well developed riparian below 4,000 feet and restricted breeding range (USFS 1982). It is also listed as Wildlife of Special Concern in Arizona. This species inhabits cottonwood and sycamore groves along streams and rivers in extreme south-central Arizona. Arizona nesting locations represent the northernmost extensions of the species range which extends south to Costa Rica. It breeds in Sonoita Creek, adjacent to the CNF but is known from only one location, Sycamore Creek, on the Forest. Historic breeding locations along Arivaca Creek (off of CNF) and in Guadelupe Canyon in the Peloncillo Mountains are no longer occupied.

Population trends. The Arizona Game and Fish Heritage Abstract describes population trends as "unknown" (AGFD 2001). Data on breeding birds are collected and entered into the Arizona Natural Heritage Data Management System (Deeble 1999), but the species is generally not detectable on NABBS routes. There are no trend data for the species in the Breeding Bird Survey database. On a state scale, the species is very rare with 1 to 5 occurrences in Arizona or very few individuals or acres occupied. The Nature Conservancy (Deeble 1999) states that there is no trend information for Arizona, but that the becard's future as a breeding bird in Arizona is tenuous given the small populations. A range of 2 to 7 nesting pairs present in the state annually was given in the same report.

Habitat Trends. The Forest Plan identified 752 acres of occupied habitat in the deciduous riparian plant community for the species on the Forest, presumably in Sycamore Canyon. Sycamore Canyon is a Research Natural Area and an identified Important Bird Area (Arizona Audubon). It is fenced to exclude livestock grazing and managed to protect riparian values. Habitats are not affected to any degree by management activities and are not thought to have changed since 1986.

Evaluation. Habitat for the species on the CNF only allows continued species existence in refugia with limitations on interactions between local populations. Populations of the species in Arizona are extremely limited and only one site is located on the CNF. The species has never been widespread. The small population on the CNF is highly susceptible to impacts occurring off of the Forest. The factors influencing range contraction for the species are poorly understood, but such contractions are common at the fringe of a species range (Deeble 1999). The species has limited utility as a MIS because of its extremely limited distribution on the Forest and poorly understood habitat relationships.

Information sources.

Deeble, B. 1999. Rose-throated becard (*Pachyramphus aglaiae*): Species management abstract. The Nature Conservancy. Arlington VA. 6 pp.

Arizona Game and Fish. 2001. *Pachyramphus aglaiae*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 4 pp.

Thick-billed Kingbird (*Tyrannus crassirostris*).

Thick-billed kingbird is included in the Riparian Species and Special Interest Species indicator groups. It was selected because of its association with open riparian having tall native trees, its limited distribution and impacts of livestock grazing (USFS 1982). This bird is found in lower elevation sycamore and cottonwood stands in canyons at the base of mountains or in larger creeks and rivers. The Forest Plan identifies 1,200 acres of occupied habitat for the Coronado National Forest: 502 acres of broadleaf evergreen woodland and 698 acres of deciduous riparian. The habitat requirements of this species are similar to the Rose-throated becard. As is the case with many other MIS bird species on the Forest, the Thick-billed kingbird is a Mexican species at the extreme northern edge of its range on the CNF. The species breeds south from southern Arizona into southern Mexico and winters into Guatemala.

Population trends. No systematic surveys are conducted for the species, and no trend data are contained in the Breeding Bird Survey database. The species is tracked in the Arizona Heritage Database (AGFD 2001f). On a state scale, the species is rare with 6 to 20 occurrences in Arizona or very few individuals or acres occupied. The species was detected in low numbers by Morrison et al (1996) in the Atascosa Mountains during surveys throughout the CNF. Taylor (1995b) noted the bird as casual in the Huachuca Mountain area. The species has been recorded several miles to north and west near Patagonia (Taylor 1995a). Population trends for the species are unknown, although Thick-billed kingbirds have also expanded their range northward since the middle of the 20th century (Arizona Game and Fish 2001).

Habitat trends. No data are available on habitat trends specific to the species. In general, the quantity and quality of deciduous riparian habitats on the CNF are believed to have increased since 1986 as a result of modifications of livestock use and fencing of riparian areas.

Evaluation. Populations of the species are limited on the CNF by the availability of suitable habitats. Because of the patchy distribution and limited extent of suitable habitats, the species will never be widespread on the Forest. While the species appears to have strong affinities to mixed deciduous riparian communities, its limited distribution and low occurrence on the CNF limit its utility as a MIS.

Information sources.

Arizona Game and Fish. 2001f. *Tyrannus crassirostris*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Morrison, M.L., R.W. Mannan, L.L. Christopherson, L.S. Hall, and J.A. Martin. 1996. Determining the status and trends of neotropical migrant bird populations in riparian vegetation in southeastern Arizona. Final Report. USFS-U of A Agreement No. CCS3-94-05-006. Tucson, Arizona.

Taylor, R.C. 1995a. A birder's guide to southeastern Arizona. American Birding Association, Inc. Colorado Springs, Colorado. 341pp.

Taylor, R.C. 1995b. Location checklist to the birds of the Huachuca Mountains and the upper San Pedro River. Borderland Productions. Tucson, Arizona. 48pp.

Revised: 5-2002 (RAG); 2-10-2005 (RAG)

Northern Beardless Tyrannulet *(Camptostoma imberbe)*

Northern beardless tyrannulet is included in the Riparian Species, Species Needing Dense Canopy, and Special Interest Species indicator groups. The species was selected as an indicator for the Forest Plan because it inhabits dense riparian mesquite understory and it could be an indicator of activities such as grazing and fuelwood harvest that alter that habitat (USFS 1982).

The Northern beardless tyrannulet is the only U.S. representative of a subfamily of tropical flycatchers that extends to South America. As is the case with several other MIS birds on the CNF, the species range is centered in Mexico and Central America where it is found in lowland tropical deciduous forests. It only reaches the U. S. in extreme southern Arizona, and only in small numbers (Tenney 2000). Mesquite, hackberry, and cottonwood thickets in valleys are the preferred habitat for this species during the breeding season (Taylor 1995a, b). Preferred habitats for the species are generally at lower elevations than are found on the CNF. It may wander into higher elevations during the winter. The Forest Plan identifies 1,270 acres of occupied habitat for the CNF: 518 acres of broadleaf evergreen woodlands and 752 acres of dry desert riparian.

Population trends. On a global scale, the northern beardless tyrannulet is considered demonstrably secure with more than 100 occurrences (AGFD 2001). On a state scale, the species is apparently secure with more than 100 occurrences in Arizona, although it could be considered quite rare in some areas (AGFD 2001). Population trend data are not displayed for this species in the Breeding Bird Survey database. In the Patagonia breeding bird survey route, the species has been recorded 6 times in the last 11 years. Numbers of birds seen ranged from 0 to 3 (Sauer 2004). Tenney (2000) noted little apparent change in populations in the United States and Arizona Breeding Bird Atlas data suggest that the general breeding distribution has changed little since the 1990s (Corman and Wise-Gervais 2005). There are not sufficient data to determine population trends on the CNF, but optimal habitats are very limited, primarily because much of the Forest is above the elevational range of the species.

Habitat Trends. Suitable habitat on the Forest is found in the Sycamore Canyon Research Natural Area. Sycamore Canyon is a Research Natural Area and an identified Important Bird Area (Arizona Audubon). It is fenced to exclude livestock grazing and managed to protect riparian values. Occupied habitats are also found in low elevation wooded canyons in the Santa Rita Mountains near Sonoita Creek and the Santa Catalina Mountains. Habitats are not affected to any degree by management activities and are not thought to have changed since 1986.

Evaluation. As is the case with other riparian songbird MIS, this species provides limited insight into Forest management effects. The Arizona population of the species is at the far northern extension of the species' range and suitable habitats within Arizona occur almost entirely off of the CNF. Within the CNF the limited suitable habitats appear to be occupied and appear to be of sufficient quality to allow the species to persist in small numbers. Habitats on the CNF likely contribute very little to population trends for the species. It is not possible to detect the effects of management on populations of the Northern beardless tyrannulet.

Information Sources.

Arizona Game and Fish. 2001g. *Camptostoma imberbe*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3 pages.

Taylor, R.C. 1995a. A birder's guide to southeastern Arizona. American Birding Association, Inc. Colorado Springs, Colorado. 341pp.

Taylor, R.C. 1995b. Location checklist to the birds of the Huachuca Mountains and the upper San Pedro River. Borderland Productions. Tucson, Arizona. 48pp.

Tenney, C.R. 2000. Northern beardless-tyrannulet *(Camptostoma imberbe). In* The Birds of North America, No. 519. (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, Pennsylvania.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD*

Bell's vireo (Vireo bellii)

Bell's vireo is included in the Riparian Species and Species Needing Dense Canopy indicator groups. The species was selected to represent riparian understory condition at elevations below 4,400 feet. It could be potentially impacted by the loss of dense riparian habitats through woodcutting and grazing (USFS 1982). This is the only species thought to meet the criteria of a species whose population changes could potentially indicate the effects of management activities on a major biological community (USFS 1982). It is susceptible to brood parasitism by brown-headed cowbirds. It is also a Forest Service Sensitive Species.

Bell's vireos are widespread, breeding throughout central and southwestern U.S. and northern Mexico. They winter from Mexico south to Central America. This species occurs near rivers and desert washes with thick understory vegetation. On the CNF, their distribution is limited to lower elevation mesquite thickets near the Forest boundary. Most high quality habitat for the species occurs off of the Forest at lower elevation river valleys between the mountains. The Forest Plan gives no data for acres of occupied habitat on the CNF.

Population Trends. No systematic surveys are conducted specifically for Bell's vireos on the CNF; however, it is regularly detected during breeding bird surveys in southeastern Arizona. It is considered common along the San Pedro River (Taylor 1995b). Morrison et al (1996) calculated a high relative abundance for the species where it was breeding in Florida Canyon in 1994. NABBS (USGS 2002) data for Bell's vireo in Arizona indicate a very slight downward trend in the population for this species in Arizona since 1980 (Figure 2). Using only data from the Sonoran desert, Bell's vireo populations show an upward trend of 3.4%, based on a smaller sample. Populations in Arizona and northern Mexico are considered stable overall based on NABBS data (Deeble 2000b).

Habitat Trends. Habitats for the species occur primarily in lower elevation riparian areas in the Santa Catalina, Santa Rita and Tumacacori Ecosystem Management Areas. By and large these are areas that are managed to preserve high valued biotic resources (Sycamore Canyon) or recreation values (Sabino Canyon) or both. These areas are generally excluded from grazing, wood cutting or other activities that would remove riparian vegetation. As a result, the limited potential habitat for the species is not thought to have changed significantly over the life of the plan.

Evaluation. Bell's vireo populations are correlated to dense riparian vegetation dominated by mesquite, willow and salt cedar below 3500 feet in elevation. Within southern Arizona, Bell's vireo habitats appear to be of sufficient quality, distribution and abundance to allow the species to persist within historic habitats. These types of habitats are very limited on the CNF and are unlikely to contribute substantially to range-wide populations for the species. The species occurs infrequently on the CNF, but has been shown to be relatively abundant within limited suitable habitat.

Information sources.

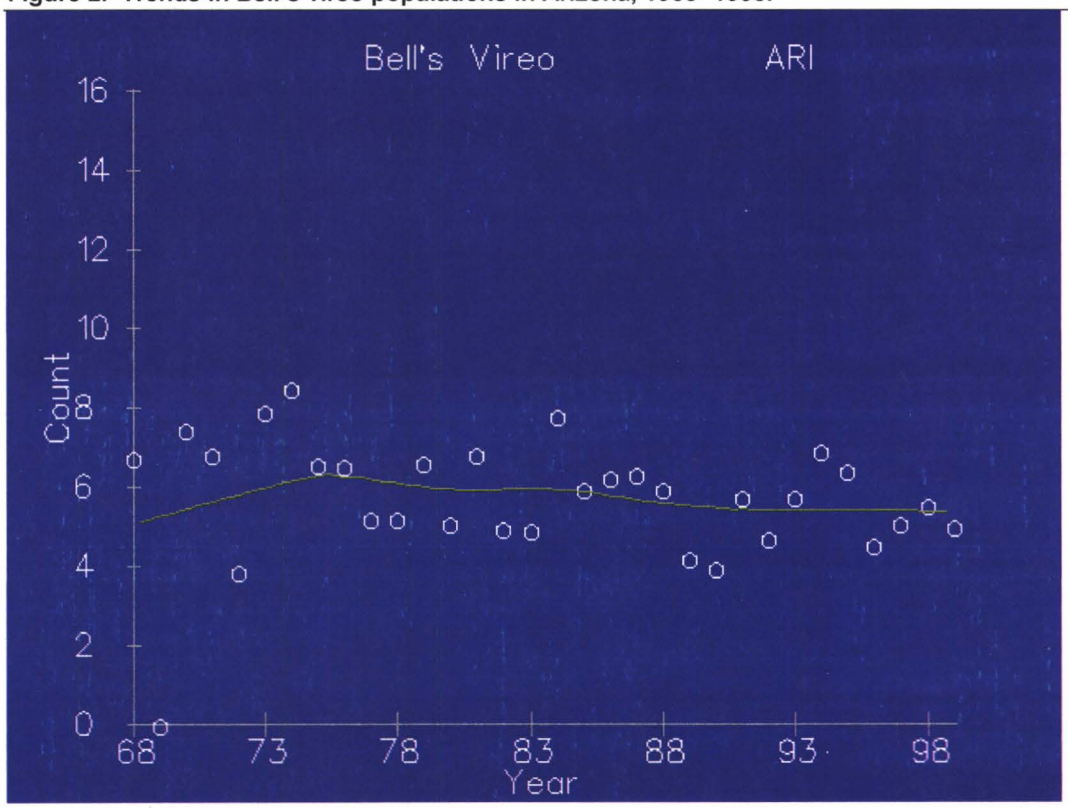
Deeble, B. 2000. Bells vireo (Vireo bellii): Species management abstract. The Nature Conservancy. Arlington VA. 11 pp.

Morrison, M.L., R.W. Mannan, L.L. Christopherson, L.S. Hall, and J.A. Martin. 1996. Determining the status and trends of neotropical migrant bird populations in riparian vegetation in southeastern Arizona. Final Report. USFS-U of A Agreement No. CCS3-94-05-006. Tucson, Arizona.

Taylor, R.C. 1995b. Location checklist to the birds of the Huachuca Mountains and the upper San Pedro River. Borderland Productions. Tucson, Arizona. 48pp.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1.* *USGS Patuxent Wildlife Research Center, Laurel, MD*

Figure 2. Trends in Bell's vireo populations in Arizona, 1968- 1998.



Merriam's Turkey (*Meleagris gallopavo merriami*).

Merriam's turkey is included in the species Needing Diversity and the Game Species indicator groups. The species was selected as MIS because they have special habitat needs: "Mixed conifer, ponderosa pine, encinal-grasslands with sufficient tree roosting sites, free water and green feed and insects during breeding season. Sensitive to grazing, fuelwood and concentrated recreation use" (USFS 1982). The Forest Plan identified 422,901 acres of occupied habitat, although it was likely less, based on factors described below.

The native turkey population on the CNF is believed to have been extirpated during the early 1900's. While no taxonomical records exist, it is likely that these birds were the Gould's subspecies (*M. g. mexicana*) based on the proximity to and connectivity between existing Gould's turkey habitats in northern Mexico and mountain ranges on the CNF. Starting in the mid-1920's and continuing through the mid-1950's, turkey were aggressively restocked into mountain ranges in southeastern Arizona. The source population for these transplants was almost exclusively Merriam's turkeys captured in northern Arizona. Although the transplants appeared to be initially successful, over time each transplanted population eventually declined. Accounts from the 1970's indicated that translocated populations had been reduced to only a few birds (Heffelfinger et al 2000). Merriam's turkeys were hunted on the CNF from the 1940's until the mid-1990's. The last turkey harvested in the Santa Catalina Mountains was in 1994, the last kill reported from the Chiricahua Mountains in 1995. There have been no turkey hunts since 1997 in the CNF.

In the 1980's, beginning with a transplant in the Huachuca Mountains, agency efforts focused on the establishment of the Gould's subspecies into suitable habitats on the CNF. In March 2000, these efforts became formalized as the Southeastern Arizona Turkey Management Plan, a cooperative effort between CNF, AGFD, BLM, Fort Huachuca and the national Wild Turkey Federation. The goal of this plan is to establish self-sustaining populations of Gould's turkeys throughout southeast Arizona (Heffelfinger et al 2000).

Population trends. Because of the lack of observations since approximately 1990, it is generally believed that Merriam's turkeys on the CNF are extirpated or nearly so. Annual surveys are conducted for Gould's turkeys and are described in the discussion for that subspecies.

Habitat Trends. There are no data on habitat trends for the species.

Evaluation. Since 1986, Merriam's turkey populations have declined on the CNF to the point where the populations are not considered viable. However, Merriam's turkeys are likely not endemic to the Forest and recent efforts have been focused on the restoration of the native Gould's subspecies. Wild turkeys have been used successfully by other national forests in Arizona as management indicators and could serve that function on the CNF. However, monitoring should focus on the Gould's subspecies.

Information sources.

Heffelfinger, J., B. Wakeling, J. Millican, S. Stone, T. Skinner, M. Fredlake and M. Adkins. 2000. Southeastern Arizona turkey management plan. Arizona Game and Fish Department. Phoenix AZ.

Gould's Turkey (*Meleagris gallopavo mexicana*)

This species is included in the threatened and endangered species indicator group for the Forest Plan because it inhabits oak-grassland-riparian associations with trees of sufficient size for roosting, free water, and green feed and insects during the breeding season. The subspecies at the time of release of the Forest Plan was not thought to be a good indicator because of interbreeding with domestic birds in the Peloncillo Mountains (USFS 1981). It is a Forest sensitive species.

The Gould's turkey is distributed throughout northern Mexico and into the southwestern U.S. Populations seem abundant and well distributed in Mexico (Heffelfinger 2000) but occur only in isolated pockets in the Huachuca, Peloncillo and Galiuro Mountains on the CNF. The native turkey population on the CNF is believed to have been extirpated from Arizona during the early 1900's. While no taxonomical records exist, it is likely that these birds were the Gould's subspecies (*M. g. mexicana*) based on the proximity to and connectivity between existing Gould's turkey habitats in northern Mexico and mountain ranges on the CNF. A small but apparently stable population of Gould's turkeys has persisted in the Peloncillo, Animas and San Luis Mountains in southeastern New Mexico. The Peloncillo Mountains are within the CNF.

In the 1980's, beginning with a transplant in the Huachuca Mountains, agency efforts focused on the establishment of the Gould's subspecies into suitable habitats on the CNF. In March 2000, these efforts became formalized as the Southeastern Arizona Turkey Management Plan, a cooperative effort between CNF, AGFD, BLM, Fort Huachuca and the National Wild Turkey Federation. The goal of this plan is to establish self-sustaining populations of Gould's turkeys throughout southeast Arizona (Heffelfinger 2000).

Population trends. Population estimates for the Huachuca Mountains are based on spring and fall counts conducted by the Arizona Game and Fish Department and incidental sightings. Results for the period 1993 to 2004 are shown in Table 7, below.

Table 7. Gould's turkey spring surveys in the Huachuca Mountains, 1993 to 2004 (*from:* Heffelfinger et al 2000:9, Arizona Game and Fish unpublished)

Year	No. Observed	Locations
1993	9 (7 males:2 females	Sawmill, Scotia, Sunnyside Canyons
1994	44	Ramsey Canyon, Patagonias, FR 49 Santa Niña, Huachuca Canyon, Peterson Ranch (Scotia Canyon), Pyeatt Ranch
1995	25 (13 males:19 females)	Copper Glance (Sunnyside Canyon), Sawmill Canyon, Scotia Canyon
1996	37 (16 males:21 females	Ramsey Canyon
1997	15	
1998	14	Ramsey Canyon, other locations
1998-1999	41 (20 males:21 females	Sunnyside Canyon, Ramsey Canyon, West Gate Guard House
1999-2000	46 (8 adult males, 4 subadult males, 13 to 14 adult females, 20 to 21 subadult females)	Population estimated at >75
2000-2001	42 (10 males, 30 hens, 2 unclassified)	Population estimated at 100 to 150
2001-2002		
2002-2003	72	

Year	No. Observed	Locations
2003-2004	90 (45 males, 45 females)	31 routes throughout the mountain range
2004-2005	321 (105 males, 216 females)	29 routes
2005-2006	223 (102 males, 120 females, 1 uncl)	30 routes
2006-2007	257 (84 males, 173 females)	21 routes
2007-2008	234 (80 males, 148 females, 6 uncl)	37 routes

Population information presented above indicates numbers increasing from releases in the 1980s. Surveys after 2000 represent a better population estimate because of methodology and breadth of effort.

In addition to monitoring populations, the CNF, AGFD Fort Huachuca are engaged in efforts to re-establish populations of Gould's turkeys into suitable habitats within the CNF. These efforts were formalized in the Southeastern Arizona Turkey Management Plan (Heffelfinger et al 2000). The goal is to establish self-sustaining populations of Gould's turkey throughout southeastern Arizona. In 1983 and 1987, a total of 21 turkeys were released into the Huachuca Mountains. After some initial mortality, this population has increased in numbers and distribution to the point where it appears to be self-sustaining. Gould's turkeys in the Huachucas can now be observed in a variety of habitats at all elevation ranges. In 1994 and 1997, a total of 67 turkeys trapped in Mexico were released in the Galiuro Mountains, but the releases suffered high mortality. Many, if not all of these birds eventually died. Efforts are continuing to establish new populations, with efforts being focused on using the Huachuca population as the source for additional transplants. Beginning in 2005 and again in 2008, birds were released into the Santa Rita and Santa Catalina Mountains. These birds appear to be surviving well.

Habitat Trends. The species is not identified as an indicator for habitat.

Evaluation. Gould's turkey populations on the CNF have increased since 1986. Increases since 1990 have been the result of natural reproduction and ongoing transplant efforts. Habitat on the CNF is of sufficient quality and distribution to allow the population to increase. There remain some significant gaps in historic distribution of the species, but further implementation of the Southeastern Arizona Turkey Management Plan should serve to reduce these gaps. The Gould's turkey is not currently a habitat indicator but may be a useful indicator for habitats in the next revision of the Forest Plan.

Information sources.

Arizona Game and Fish Department. Unpublished. Annual spring turkey survey data for the Huachuca Mountains. AGFD. Tucson AZ.

Heffelfinger, J., B. Wakeling, J. Millican, S. Stone, T. Skinner, M. Fredlake and M. Adkins. 2000. Southeastern Arizona turkey management plan. Arizona Game and Fish Department. Phoenix AZ.

Buff-breasted Flycatcher *(Empidonax fulvifrons)*

Buff-breasted flycatcher is included in the Species Needing Diversity and Special Interest Species indicator groups. It was selected as an indicator for the Forest Plan because it inhabits open pine forests above 6,000 feet and because "habitat in limited breeding range needs to be protected from activities that would change its current nature." It was considered sensitive to timber harvest and prescribed burning (USFS 1981, USFS 1982). There is nothing in the planning records to indicate why the species was considered a good indicator of diversity.

The buff-breasted flycatcher occurs quite widely in open pine forests south of the United States in Mexico and Central America. As is the case with several MIS songbirds on the CNF, habitats on the Forest are at the extreme northern edge of this species' range. The distribution and numbers of Buff-breasted flycatchers in Arizona were reported to have decreased markedly over the last century (Phillips 1964, Bowers and Dunning 1994). Habitat often includes an open under story of grasses and small trees or burned forest with patches of living pines (Latta et al. 1999). The Forest Plan identified 90 acres of occupied mixed conifer habitat for the Coronado National Forest located in Carr and Scotia Canyons in the Huachuca Mountains (USFS 1986). The species is found on the CNF only during the breeding season (March to September). It winters in Mexico and Central America. The population of the species is probably affected by fire maintenance of preferred habitat.

Population trends. On a state scale, the species is very rare with 1 to 5 occurrences in Arizona or very few individuals or acres occupied (AGFD 2001). Bowers and Dunning (1994) noted that population numbers varied widely between years in Arizona, but speculated that increases in population size in the Huachuca Mountains followed the Carr Fire in 1977. For the years 1980 to 1983 population totals for 3 mountain ranges in southeastern Arizona are shown in Table 8, below.

Table 8. Population of buff-breasted flycatchers in southeastern Arizona from 1980 to 1983 with emphasis on the Huachuca Mountains (*from* Bowers and Dunning 1994:11)

Mountain Range Canyon	1980	1981	1982	1983
Huachuca				
Carr	5 adults	2 adults	8 adults	9 adults, 1 juvenile
Garden	no data	no data	2 adults, 3 juveniles	2 adults
Rock Spring	no data	2 adults, 1 juvenile	no data	no data
Sawmill	>4 adults	6 adults	11 adults, 15 juveniles	7 adults, 9 juveniles
Scotia	no data	2 adults, 1 juvenile	6 adults	2 adults
Sunnyside	no data	2 adults, 3 juveniles	1 adult	1 adults
Total	9 adults	14 adults, 5 juveniles	28 adults, 18 juveniles	21 adults, 10 juveniles
Chiricahua *Total*	1 adult	2 adults	5 adults, 3 juveniles	3 adults
Santa Catalina				

Mountain Range Canyon	**1980**	**1981**	**1982**	**1983**
Total	1 adult	no data	2 adults	0 individuals
Total All Ranges	11 adults, 0 juveniles	16 adults, 5 juveniles	36 adults, 21 juveniles	24 adults, 10 juveniles

Martin (1997) did extensive surveys for the species in canyons where the bird has been seen during the last 20 years. He also surveyed in randomly selected sites concentrating on the Chiricahua, Santa Catalina, and Huachuca Mountains. This author reported 121 birds observed including 19 in canyons not previously having records. In 2000, Conway and Kirkpatrick (2001) repeated Martin's surveys and reported significant population declines between 1996 and 2000.

Chase (2001) provides more recent information on species abundance in the Huachuca Mountains. This author surveyed 3 areas. Relative abundance was measured as the number of individuals detected per census during 6 censuses over the 1998 and 1999 breeding periods. Results of this study are presented in Table 9.

Table 9. Relative abundance of buff-breasted flycatchers in 3 locations in the Huachuca Mountains, 1998 and 1999. (*from* Chase 2001:156)

Location (habitat)	**Garden Canyon** (riparian forest)	**Sawmill Canyon** (pine-oak forest)	**Reef (Upper Carr Canyon)** (pine-oak forest)
Relative Abundance (*mean ± standard deviation for individuals detected/census*)	.02 ± .08	.28 ± .44	.38 ± 0.45

Healy (2002) also noted the frequency of the species being seen during visits to Sawmill Canyon on Fort Huachuca from 1994 to 2001. This observer saw buff-breasted flycatchers on at least 80 of his visits from late March to early August during that period.

Habitat Trends. The species appears to benefit from fires that open up the forest overstory and create and maintain herbaceous understory. Fire suppression since the turn of the century has likely reduced habitat suitability across the Forest. However, since 1982, fires have occurred within 123,000 acres of potentially suitable habitat in the Ponderosa pine, mixed conifer and coniferous forest transition vegetation types. Recovery of many of these areas may take many years, but should ultimately result in conditions suitable as flycatcher habitat.

Evaluation. The Buff-breasted flycatcher has one of the most restricted breeding ranges of any bird in the U.S. (Bowers and Dunning 1994). An estimated 98% of the U.S. breeding population is restricted to a few canyons in the Huachuca and Chiricahua Mountains. Because it is a species at the northern end of its breeding range and very limited in distribution, the population on the Forest is easily influenced by events off of the Forest or stochastic events that affect the species primary breeding areas. A significant effort has been expended over the past few years to evaluate the status of this species. It appears that sufficient information exists to detect trends in population on the Forest, but information is lacking on population demographics (Conway and Kirkpatrick 2001). Information on recruitment and immigration and the status of the Mexico populations is needed to help determine management strategies for the species. The species may

have utility as an indicator for the open montane and riparian forests it prefers, but this utility is affected by the very limited distribution and small population of the bird.

Information sources.

Arizona Game and Fish. 2001h. *Empidonax fulvifrons pygmaeus*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Bowers, R. K., Jr., and J. B. Dunning, Jr. 1994. Buff-breasted flycatcher *Empidonax fulvifrons)*. *In* The Birds of North America, No. 125 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Chase, Jameson Fales. 2001. Host and habitat partition by sympatric brood parasites in Arizona. PhD dissertation. Department of Environmental, Population, and Organismic Biology. University of Colorado. 162pp.

Conway, C.J. and C. Kirkpatrick. 2001. Population status, detection probability and effects of fire on Buff-breasted flycatchers. Final Report. Arizona Game and Fish Department Heritage Fund Grant I99028. Arizona Cooperative Fish and Wildlife Research Unit. Tucson AZ. 60 pp.

Healy, Stuart. 2001. Raw bar graphs and records for Scheelite and Sawmill Canyons. http://www.aztrogon.com. 4pp.

Latta, Marjorie J., Carol JH. Beardmore, and Troy E. Corman. 1999. Arizona partners in flight. Bird conservation plan. Version 1.0. Arizona Game and Fish Department. Phoenix, Arizona. Nongame and Endangered Wildlife Program Technical Report 142. 331pp.

Martin, J. A. 1997. Distribution, abundance, and habitat characteristics of the buff-breasted flycatcher in Arizona. M.S. thesis, University of Arizona. Tucson, Arizona.

Morrison, M.L., R.W. Mannan, L.L. Christopherson, L.S. Hall, and J.A. Martin. 1996. Determining the status and trends of neotropical migrant bird populations in riparian vegetation in southeastern Arizona. Final Report. USFS-U of A Agreement No. CCS3-94-05-006. Tucson, Arizona.

Revised and updated: 05-2002 (RAG);
2-17-2005 (RAG)

Montezuma (Mearns') Quail (*Cyrtonyx montezumae mearnsi*)

Mearns' quail are included in the Species Needing Herbaceous Cover, Game Species and Special Interest Species indicator groups. The species was selected as MIS because it inhabits high quality grassland in encinal oak habitats (USFS 1982). It is "dependent upon good grass cover during the nesting season; moderately heavy to heavy grazing destroys needed nesting cover, resulting in the disappearance of the birds" (USFS 1981). In areas mapped as "high density" Mearns' quail habitats, additional management direction is provided in Forest Service Manual 2631, restricting livestock utilization to 45% or less by weight. The Forest Plan identified 225,410 acres of occupied habitat within several vegetation types (Table 10). High-density habitats are designated in the Chiricahua, Santa Rita Patagonia and Huachuca Mountains.

Table 10. Acres of occupied habitat for Mearns' quail identified in the 1986 Coronado National Forest Plan.

Vegetation Community	Habitat Acres
Southwestern desertscrub	16,320
Desert Grassland	10,871
Plains grassland	26,349
Chaparral	306
Broadleaf evergreen woodlands	154,440
Coniferous woodlands	7,841
Dry desert riparian	1,149
Deciduous riparian	3,070
Evergreen riparian	5,064
Total	225,410

Mearns' quail breeding range extends northward from central Mexico to the mountains of southwest Texas, southwest New Mexico and Southeast Arizona. On the Coronado National Forest, they are commonly found in Madrean evergreen woodlands throughout the Forest at elevations from 3,500 to 5,500 ft. Highest densities are found in the Atascosa, Tumacacori, Santa Rita, Patagonia, Huachuca, Chiricahua and Peloncillo Mountains.

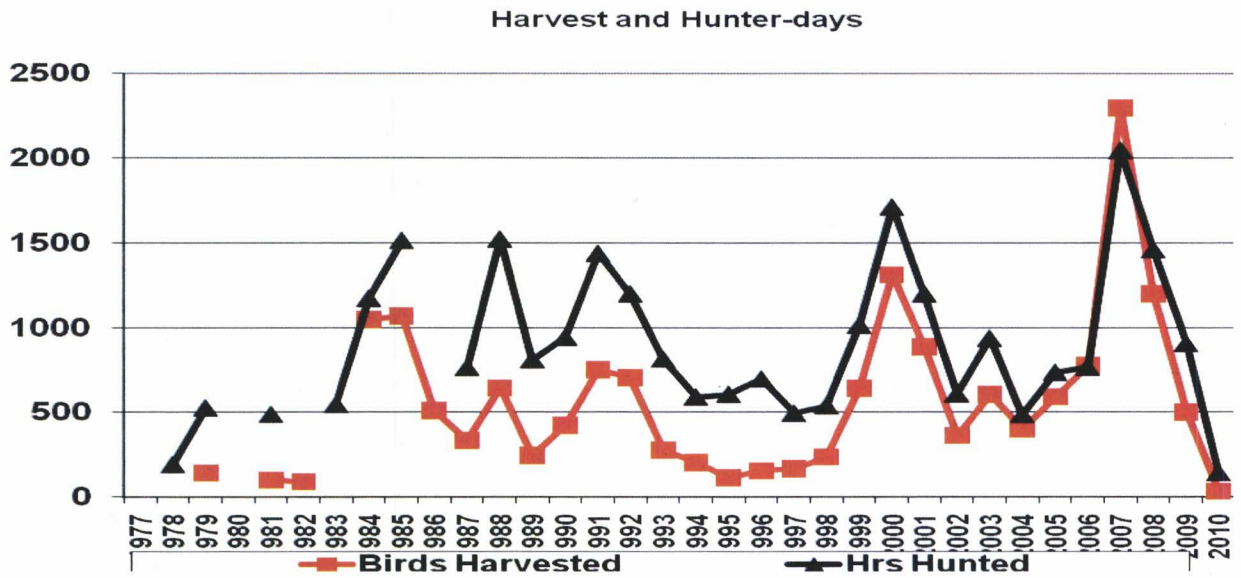
Mearns' quail habitat on the Forest consists predominantly of open Madrean evergreen woodlands containing oak *(Quercus spp.)*, juniper (*Juniperus spp.*) and pines (*Pinus spp.*) with abundant grass understory (Bristow and Ockenfels 2000). A perennial grass understory over 6 inches (15 centimeters) in height is important to this species as hiding cover from predators. Lack of suitable hiding cover is thought to decrease survival (Hefflefinger and Olding 2000). Tall grass is also important as thermal cover for roosting birds. At night, the birds huddle in tight groups on the ground in tall grass commonly in a drainage bottom. The roost site is often near habitat structure that provides additional thermal cover (Stromberg 1990). In addition to grass cover, quail use is positively related to tree canopy cover greater than 20%. They rarely venture more than 45 yards from the edge of the trees (R. Brown 1978).

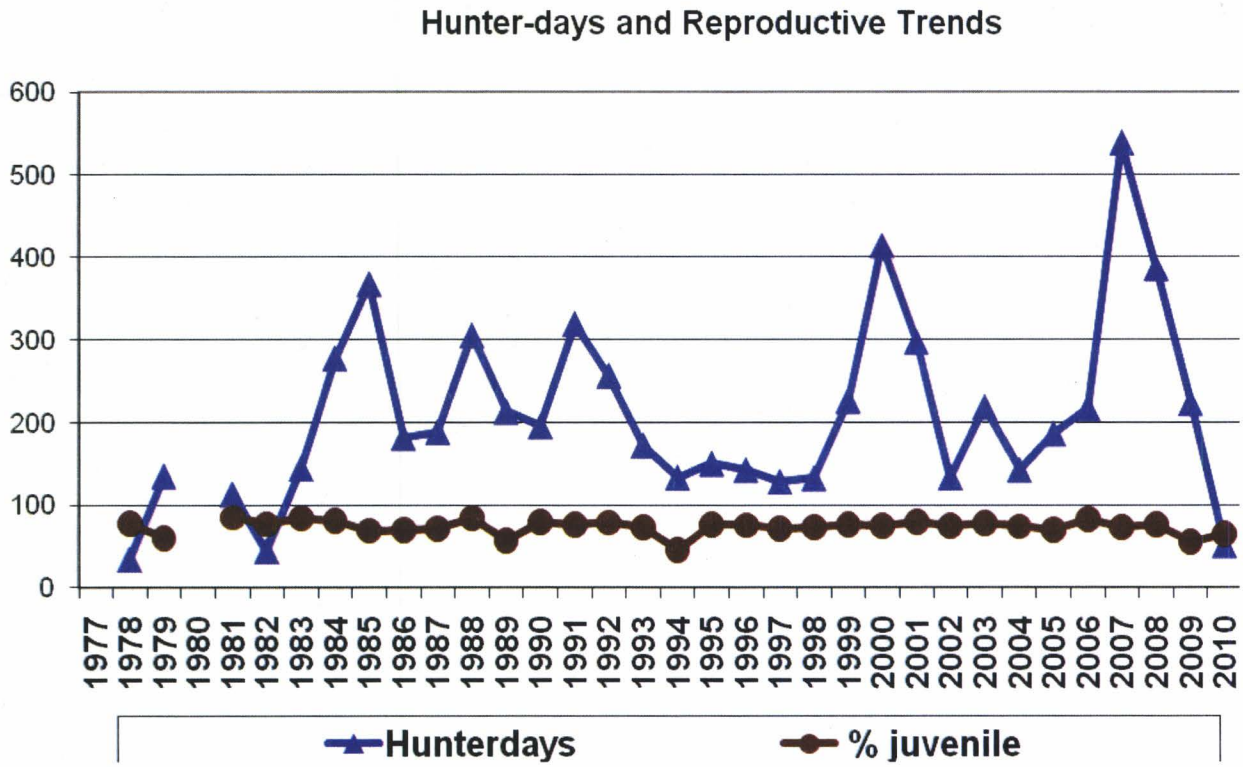
Montezuma quail breeding typically begins in mid-June and young birds are hatched in August. Reproductive timing coincides with the summer "monsoon" storms that begin in early July and provide the majority of the annual precipitation throughout much of Montezuma quail range. Nearly all of the plants the quail rely on for food and cover grow in response to summer precipitation. Montezuma quail are highly terrestrial. They feed exclusively on the ground

where they dig for bulbs and tubers of wood sorrel (*Oxalis amplifolia*) and flat sedge (*Cyperus rusbyi*) that comprise the majority (50-85%) of their diet. The remainder of their diet is comprised of seeds and insects (Bishop and Hungerford 1965, Brown 1978). They occasionally drink water, but are capable of subsisting on moisture provided by their food (D. Brown 1989).

Heavy grazing in Montezuma quail habitats has been shown to impact quail populations regardless of food availability. R. Brown (1978, 1982) found that 95% of the mated pairs counted during his study were located in areas averaging 45% grazing utilization or less for their entire home range. Grazing in excess of 55% by weight nearly eliminated local quail populations by removing available cover, even though production of preferred quail food plants was higher on heavily grazed pastures. Bristow and Ockenfels (2000) studied quail populations in both grazed and ungrazed sites on the forest. They concluded that the Forest's grazing program as currently administered on the study area was not significantly affecting the Mearns' quail population.

Population trends: Effective techniques for measuring Mearns' quail abundance are lacking (Stromberg 2000). Unlike Gambel's, scaled and masked bobwhite quail, Mearns' quail cannot be reliably censused using breeding season call counts. Brown (1976) attempted to use taped recorded calls to elicit a response, but met with limited success. Methods including mark-recapture and surveying for sign have also proved unreliable (Brown 1976). Bristow and Ockenfels (2000) successfully used pointing dogs to estimate relative abundance of birds among various areas, seasons and years. A total of 51 survey routes were censused on 5 study sites in southeastern Arizona between 1997 and 2000. Arizona Game and Fish Department biologists, Forest Service biologists and volunteers have conducted periodic flush counts since the mid-1990's. Survey efforts have concentrated in the core of Mearns' quail distribution on the Forest, which consist of the Tumacacori, Santa Rita and Huachuca EMAs. These efforts were terminated because of difficulty in finding good bird dogs and collecting statistically valid data. In addition, AGFD has collected harvest data from quail hunters in selected canyons since approximately 1980. Since 1987, harvest data has been collected annually by AGFD via a small game mail questionnaire. Harvests have fluctuated widely with no discernable long-term trend. (See figures below).





Evaluation. Quail population fluctuations are highly correlated with two things: the amount and timing of summer precipitation and the presence of suitable cover, yearround. Like many small game species, populations can fluctuate dramatically from year to year in response to rainfall, but are capable of rapid recovery. Grazing utilization rates have been generally reduced in Mearns' quail habitats across the Forest as allotment management plans have been revised, but the number of acres affected has not been quantified. Mearns' quail habitat is of sufficient quality, distribution and abundance to allow the species to be well distributed across the CNF.

The species appears to have utility as an indicator of residual herbaceous cover in Madrean evergreen woodlands.

Information sources.

Bishop, R.A., and C.R. Hungerford. 1965. Seasonal food selection of Arizona Mearns' quail. Journal of Wildlife Management 43:522-526.

Bristow, Kirby D. and Richard A. Ockenfels. 2000. Effects of human activity and habitat conditions on Mearn's quail populations. Arizona Game and Fish Department. Phoenix, Arizona. Research Branch Technical Guidance Bulletin No. 4 (August 2000). 27pp.

Brown, D. E. 1989. Arizona Game Birds. The University of Arizona Press. Tucson.

Brown, Richard L. 1978. An ecological study of Mearns' quail. Arizona Game and Fish Department. Research Division. Federal Aid in Wildlife Restoration. Project W-78-R-22, Work Plan 2, Job 1. 26 pp.

Brown, R.L. 1982. Effects of livestock grazing on Mearns' quail in southeastern Arizona. Journal of Range Management 35:727-732.

Heffelfinger, James R. and Ronald J. Olding. 2000. Montezuma quail management in Arizona. Pages 183-190 *in* L.A. Brennan, W.E. Palmer, L.W. Burger, Jr., and T.L. Pruden (eds.). Quail IV: Proceedings of the Fourth National Quail Symposium. Tall Timbers Research Station, Tallahassee, FL.

Stromberg, M.R. 1990. Habitat, movements and roost characteristics of Montezuma quail in southeastern Arizona. Condor 56:123-125.

Revised and updated: 05-2002 (RAG)
02-16-2005 (RAG)
05-04-2011 (RAG)

Baird's Sparrow (*Ammodramus bairdii*)

Baird's sparrow is included in the Species Needing Herbaceous Cover indicator group. The species was selected for the Forest Plan because of its association with tall, dense tobosa/gramma grasslands. This habitat is impacted by livestock grazing (USFS 1982).

The Baird's sparrow breeds in the mixed grass prairies of the northern Great Plains. The species winters in the southwest from Texas to Arizona. In southeastern Arizona, it prefers hilly grasslands at 4,000 to 5,000 feet. The CNF is in the northwest corner of the winter range for the species. Structure of the grassland may be more important than species composition. The species apparently avoids overgrazed rangeland and most agricultural land. It occurs only in the winter and can be sporadic in numbers and distribution (Whetstone 1995). The Forest Plan gives no data for acres of occupied habitat on the Coronado National Forest. It is the only non-breeding species selected as a MIS.

Monitoring data and population trends. On a state scale, the species is rare with 6 to 20 occurrences in the Arizona or few individuals or acres (AGFD 2001). BBS data indicate a 1.9% annual decline in Baird's sparrow populations from 1966-1990 (USGS 2002). The decline appears to be related to agricultural practices in nesting habitats, specifically conversion of native prairie to agriculture. On wintering grounds, threats include overgrazing and urban development, but only a small percentage of suitable habitat is found on the CNF. Whetstone (1995) conducted an extensive inventory of potential habitats for the species on the CNF. He identified the San Rafael Valley as the most significant wintering area for the bird on the Forest. Ruth (U.S. Geologic Survey, pers. comm. with T. Deecken) offers the most comprehensive survey information for that valley. This author noted the number caught in mist nets after flushing birds in 7-hectare plots over a 3-year period. Preliminary results are presented in Table 11, below.

Table 11. Densities of Baird's sparrows in the San Rafael Valley, 1999 to 2001. (*from* Janet Ruth, U.S. Geologic Survey, pers. comm.)

	Density by Year *(no. birds/7 hectare)*		
Plot No.	1999	2000	2001
1	3	5	3
2	4	0	0
3	6	3	0
4	1	0	1
5	6	4	3
6	6	2	1
Average	4.33	2.33	1.33

These data suggest an apparent downward trend in the species wintering population over the 3 years of the study. Ruth also suggested an apparent species affinity for grass stands of 4 to 8 inches in height, and negative associations with grass structure greater than 15-20 inches in height.

During the period 1996 to 2001, Baird's sparrow was recorded only twice on the Ramsey Canyon Christmas Bird Count. During 1997 to 2000, the species was seen 4 times with a high number of 5 in 2000 on the nearby Patagonia count (National Audubon Society 2002).

Evaluation. Baird's sparrow habitat is neither abundant nor well distributed on the Forest, and observations of the species are few. Limited suitable habitats exist on the Forest, but the species appears to prefer open grasslands at lower elevations off of the Forest. The bird is among the most difficult of North American birds to observe (Whetstone 1995). It is solitary, secretive and easily confused with other sparrows, even by experienced observers. It is a non-breeding winter migrant at the fringe of its range in southern Arizona. The species' population trends appear to be primarily influenced by conditions in its northern prairie breeding grounds. These factors all tend to diminish the species' value as an MIS.

Information sources.

Arizona Game and Fish. 2001j. *Ammodramus bairdii.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

National Audubon Society. 2002. Christmas bird counts, results and analysis. http://209.177.45.29/birds/cbc/hr/graph.htm.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD*

Whetstone, Jack. 1995. Baird's sparrow winter habitat assessment on the grasslands of the Coronado National Forest. U.S. Department of Interior, Bureau of Land Management. Sierra Vista, Arizona. Unpublished.

American Peregrine Falcon *(Falco peregrinus anatum)*

This species is included in the Threatened and Endangered Species group in the Forest Plan. It was selected as an indicator for the Forest Plan because it requires suitable cliffs for nesting and is sensitive to recreation (rock climbing), mining and localized timber and fuelwood harvest (USFS 1982). The species was listed by the USFWS as an Endangered Species in 1986 when the Forest Plan was adopted, but de-listed in 1999 when it was determined that recovery plan goals had been exceeded. It is still a Forest Service Sensitive species. The Forest Plan gives no data for acres of occupied habitat on the Coronado National Forest, although it was noted that there were limited yearlong sightings on the Forest.

Population trends. More than 200 breeding pairs are known for Arizona, a number that has risen significantly from 20 years ago (Glinski 1998). Garrison and Spencer (1996) noted that fledging production averaged 1.2 birds per eyrie during the 1995 breeding season in the State. Selected falcon nests are monitored annually on the CNF. Reproductive success for the period 1990 to 2001 for samples of the 29 known eyries on the Coronado National Forest is presented in Table 12 below. Populations have increased on the CNF since 1986. Nationwide, the Peregrine falcon population is considered secure and has been increasing for the past 30 years (USFWS 2003). A monitoring plan has been developed as part of the de-listing strategy for the bird (USFWS 2003). Fourteen territories on the Forest have been identified for continued long-term monitoring in the monitoring plan. In 2006, 12 0f these sites were occupied, producing a total of 11 young (Abbate 2006).

Table 12. Reproductive success for monitored eyries on the Coronado National Forest, 1990 to 2001 (U.S. Forest Service, unpublished)

	Year											
Reproductive Success	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
No. of Eyries Monitored	10	no data	8	8	9	8	5	no data	5	1	1	9
Average no. of young fledged/eyrie	.8	no data	.8	.9	1.1	1.4	no data	no data	.8	2.0	3.0	1.2

Habitat trends. The cliff habitats used by nesting peregrines are relatively unaffected by management, so the amount of available habitat is considered stable. Beginning in approximately 1990, annual seasonal closures have been in effect on several eyries where recreational rock climbing has been shown to negatively affect falcons. Reductions in nesting season disturbance have resulted in increases in the quality of available habitats. Closures are expected to remain in effect as long as falcons are using the affected territories.

Evaluation. Populations of Peregrine falcons are found in suitable habitats in nearly all mountain ranges on the CNF and are considered secure. Habitat for the species is sufficient to allow the species to be well distributed across the Forest, although the availability of suitable cliff sites will eventually limit population expansion. Threats to the population have been reduced through seasonal closures to protect nest sites. The species is relatively easy to monitor although periodic natural fluctuations in such a small breeding population make trends difficult to detect. Because of the sensitivity of the species to recreational disturbance, it has some utility as a management indicator for this type of activity. However, large-scale population trends may

be affected by events and conditions off of the Forest. The range-wide increase in population for the species is no doubt due in large part to the elimination of organochloride pesticides in the U.S.

Information sources.

Abbate, D. 2006. Peregrine falcon nest site monitoring in Arizona: 2006 breeding-season results. Arizona Game and Fish Department, Research Branch, Phoenix, Arizona.

Garrison, Barbara A. and Janine A. Spencer. 1996. Arizona peregrine falcon 1995 reproductive survey results. Arizona Game and Fish Department. Phoenix, Arizona. Nongame Endangered Wildlife Program. Final Report. 43pp.

Glinski, R.L., ed. 1998. The raptors of Arizona. The University of Arizona Press. Tucson, AZ. 220 pp.

USDI Fish and Wildlife Service. 2003. Monitoring plan for the American peregrine falcon, a species recovered under the Endangered Species Act. U.S. Fish and Wildlife Service Divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region. Portland , OR. 53 pp.

Revised and updated: 5-2002 (RAG)
2-16-2005 (RAG)
05-04-2011 (RAG)

Five-striped sparrow (Aimophila quinquestriata)

The Five-striped sparrow is included in the Special Interest Species and the Threatened and Endangered Species indicator groups. The species was identified with subtropical desert grasslands, scrub and thornscrub in steep walled canyons. It was identified as being sensitive to recreation, grazing and fuelwood harvesting (USFS 1982). The range for Five-striped sparrows is centered in Mexico. The population nesting on the CNF is at the extreme northern edge of the species' distribution. The Forest Plan identified 18,279 acres of occupied habitat on the CNF (Table13). In 1981, five breeding localities were known on the CNF: Tonto, Sycamore and Holden Canyons in the Atascosa Mountains and Chino Canyon in the Santa Rita Mountains. Management activities that could threaten the species existence on the forest are grazing and brush removal projects that reduce grass and shrub density essential for nesting.

Table 13. Acres of occupied habitat for Five-striped sparrow identified in the Coronado National Forest Plan.

Vegetation Community	Habitat Acres
Southwestern desertscrub	1,509
Broadleaf evergreen woodlands	15,610
Dry desert riparian	408
Deciduous riparian	752
Total	18,279

Habitat for Five-striped sparrows consists of dense hillside vegetation ranging from brushy semidesert to tropical deciduous woodland (Groschupf 1992). The density of the vegetation, rather than the species composition or topography, appears to be the most important factor determining habitat suitability (AGFD 1998). The species is migratory in the northern extreme of its range. Nesting in Arizona occurs June through September and the species has left breeding territories by October.

Monitoring methods and population trends. No formal surveys have been accomplished for Five-striped sparrows since 1991 when Groschupf (1994) revisited sites intensively monitored during the 1970's. The species has not been detected on the Pena Blanca breeding bird survey route (USGS 2002). The only trend data available are provided by Groschupf (1992) showing an apparent decline in bird numbers between 1977 and 1991. No reasons for the apparent decline were evident, but periodic range contractions and expansions are not uncommon for species at the edge of their geographic range. Because of its rarity, the bird is highly sought after by birders and has been observed on the Forest every year. Historic habitats are presumed to be occupied based on regular observations.

Evaluation. The Five-striped sparrow is a Mexican species and southern Arizona is at the very northern tip of its breeding range. It was first observed in Arizona in 1957, apparently as a result of northward range expansion of the main population centered in Mexico. Its range within the CNF is limited by its requirement for dense, brushy tropical deciduous woodland between 3500-4000 feet; therefore it is unlikely that the species will ever be abundant and well distributed across the Forest. Because of its extremely limited distribution on the CNF, the population on the Forest is easily influenced by events off of the Forest or stochastic events that affect the species primary breeding areas. Demographic data on local populations are lacking, as are

quantified habitat parameters. These factors tend to limit the usefulness of the species as a Forest-wide MIS; however, because of the species' rarity in the U.S., the Forest should continue to support monitoring efforts.

Information sources.

Arizona Game and Fish. 1998. *Amphispiza quinquestriata.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Groschupf, K. 1992. Five-striped sparrow. *In* The Birds of North America, No. 21 (A. Poole, P. Stettenheim, and F. gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington DC: The American Ornithologists' Union.

Groschupf, K. 1994. Current status of the Five-striped sparrow in Arizona. Western Birds 25:192-197.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD*

Revised and updated: 5-2002 (RAG); 2-10-2005 (RAG)

Mammals

Black Bear (*Ursus americanus*)

Black bear is included in the Riparian Species, Species Needing Diversity and the Game Species indicator groups. It was selected primarily because of the occurrence of a high-density population in the Pinaleno Mountains and because it is dependent on heavy cover. The Forest Plan identified 641,113 acres of occupied habitat in all vegetation types except plains grassland and dry desert riparian. Because of the "sky island" nature of the CNF, black bear populations tend to be isolated from each other by wide expanses of non-suitable habitat between the mountain ranges. Some movement between ranges is known to occur, but is not common.

Black bears are habitat generalists and do best in areas of high vegetative diversity. They will use riparian areas for cover and as travel corridors. Individuals establish home ranges but are capable of moving great distances in response to climatic conditions or food availability. They feed on a variety of items including berries, acorns, grass, insects, mesquite beans and carrion. Prickly pear cactus fruits are seasonally important in some years. In general, their diet consists of approximately 90% plant material and only 10% animal matter, primarily in the form of insects. Black bears are relatively intelligent and opportunistic and will occasionally become a nuisance in developed campgrounds where human food is available. They can be effective predators, and have been known to take livestock, especially calves, on occasion. Black bears are normally solitary and will establish and defend territories, a behavior that tends to limit population densities in any given area.

Population Trends: Black bear populations are highly correlated to annual precipitation and its effect on the production of preferred foods such as oak acorns and manzanita berries. Bear numbers are also influenced by hunting, which is regulated by the AGFD. Because of their secretive nature and affinity for dense cover, black bears are extremely difficult to census. AGFD estimates populations based on qualitative analyses of habitat carrying capacity. In 1980, the population was estimated to be 209 animals on the CNF, based on AGFD estimates (USFS 1982). In 1999, the statewide population was estimated to be 2500 black bears in 12,600 square miles of occupied habitat (AGFD 1999). A current forest-wide population estimate is not available, but the range of the species on the CNF has not changed significantly since 1986.

Hunt structures are generally conservative with an annual harvest target of no more than 125 females and a total of 250 or more bears. Recently, bear hunt structures have been aimed at reducing populations in areas where nuisance bear activity is high. Sport and depredation harvest data are collected by the AGFD (Table 14). An additional number of bears are annually captured and moved or killed as nuisance bears in southeastern Arizona. Many of these animals are presumed to have originated on the CNF. The number of nuisance bears captured is generally small, although the number has risen over the past few years. Twenty-five bears were captured during 2000-2001. Bear management activities on the CNF have focused on reducing bear-human interactions through installation of "bear proof" trash containers and food boxes throughout the Forest.

Table 14. Black bear sport harvest from game management units within the Coronado National Forest, 1995-2000.

	Management Unit						
Year	29	31	32	33	34A	35A	Total
1995	8	7	2				17
1996	1	7	3	3	1	1	16
1997	23	8	7				38
1998	4	7	1				12
1999	15	27	5			1	47
2000	13	23	16		1		53
2001							
2002							
2003	18	8	6		1	4	37
2004							

Evaluation. Black bears are both wide-ranging and secretive, making them extremely difficult to census with any degree of accuracy. No attempts are made to survey for bears on the Forest. However, they are highly adaptable generalists and are not highly correlated with a particular habitat except for dense cover in the 1-6 foot height class. This type of cover is abundant across the forest. Populations are primarily influenced by annual rainfall and by sport hunting or depredation removal.

Across the Forest, habitat is of sufficient quality and abundance to allow the species to be well distributed across federal lands. Historic habitats remain occupied, although the population fluctuates within occupied habitats based on the availability of forage. No discernable population trends can be detected, although it is generally believed that poor mast crops over the past several years have led to a decrease in the carrying capacity for bears on the Forest. This has been evidenced by an increase in nuisance bear interactions both on and off of the Forest. This is part of a long-term cycle in populations related to climate and is not influenced to any degree by management. Black bears are not well suited as a MIS as it is difficult to estimate population numbers and to correlate population numbers to a specific habitat type on a Forest-wide scale. The limited information available on annual harvest provides little insight into habitat conditions.

Information sources.

Arizona Game and Fish Department. 2000. Black bear harvest data *in* Arizona game survey and harvest data summary. Federal Aid Project W-53-M-50. Arizona Game and Fish Department, Phoenix, AZ.

LeCount, A.L., R.H. Smith, and J.R. Wegge. 1984. Black bear habitat requirements in central Arizona. Ariz. Game and Fish Dept., Spec. Rep. No 14. Phoenix. 49pp. Brown, D.E. 1989. Arizona game birds. University of Arizona Press and the Arizona Game and Fish Department. Tucson.

Revised and updated: 5-2002 (RAG); 7-5-2004 (RAG); 2-10-2005 (RAG)

White-tailed Deer (*Odocoileus virginianus couesi*).

White-tailed deer is included in the Species Needing Diversity, Species Needing Herbaceous Cover and Game Species indicator groups. The species was selected as a management indicator of light to moderate quality encinal oak and oak grassland habitats (USFS 1982). According to the background materials in Forest Files: "Overgrazing of these habitats results in invasion by shrubs causing disappearance of white-tailed deer. Large scale fuel wood cutting can open up encinal stands permitting invasion by shrubs with subsequent loss of white-tailed deer...Prescribed burns can open up chaparral and dense stands of pinyon-juniper creating favorable conditions for white-tailed deer." (USFS 1981). The Forest Plan identifies 1,430,071 acres of occupied habitat for the species in all vegetation types on the Forest.

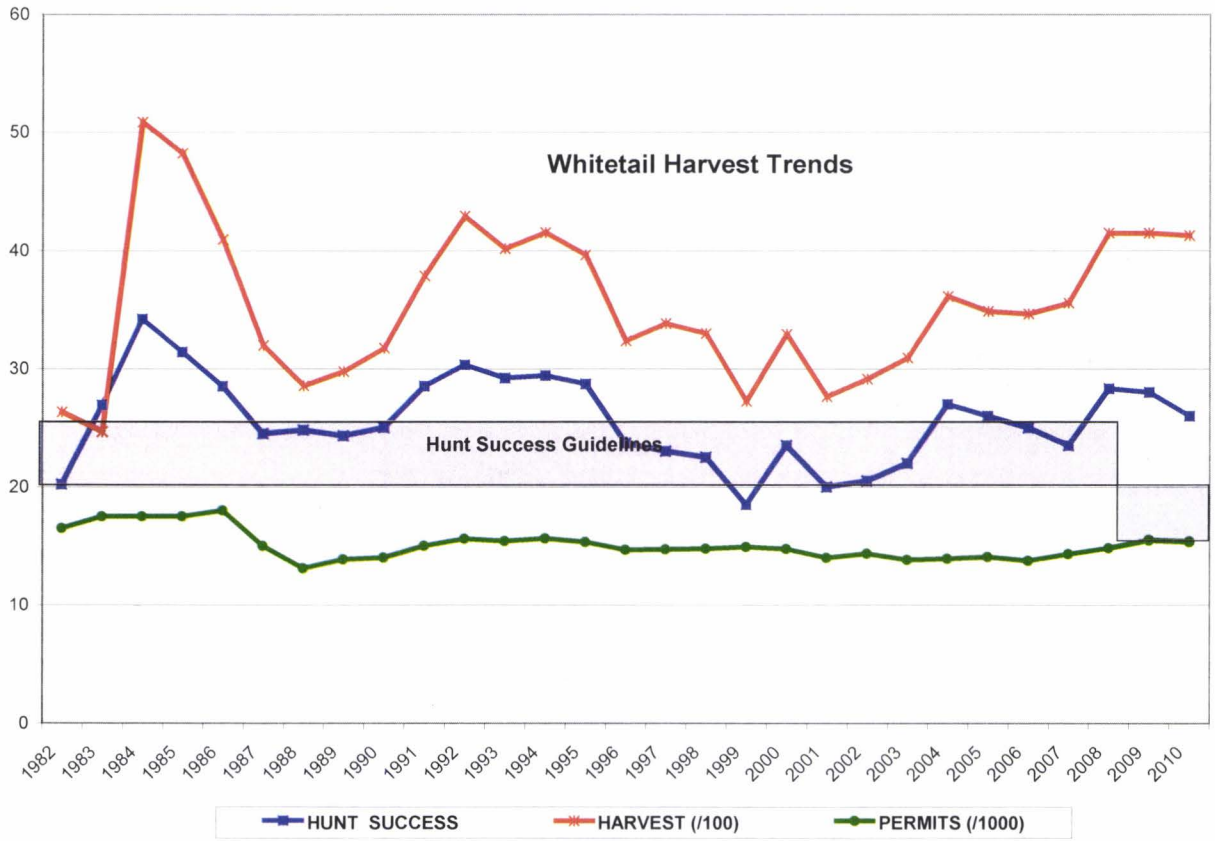
Coues white-tailed deer range from the mountain ranges of northern Mexico north through central and southeastern Arizona to the Mogollon Rim. They occur primarily in mixed oak woodlands and higher elevation semidesert grasslands and locally in pine forests and along riparian corridors (Ockenfels 1991).

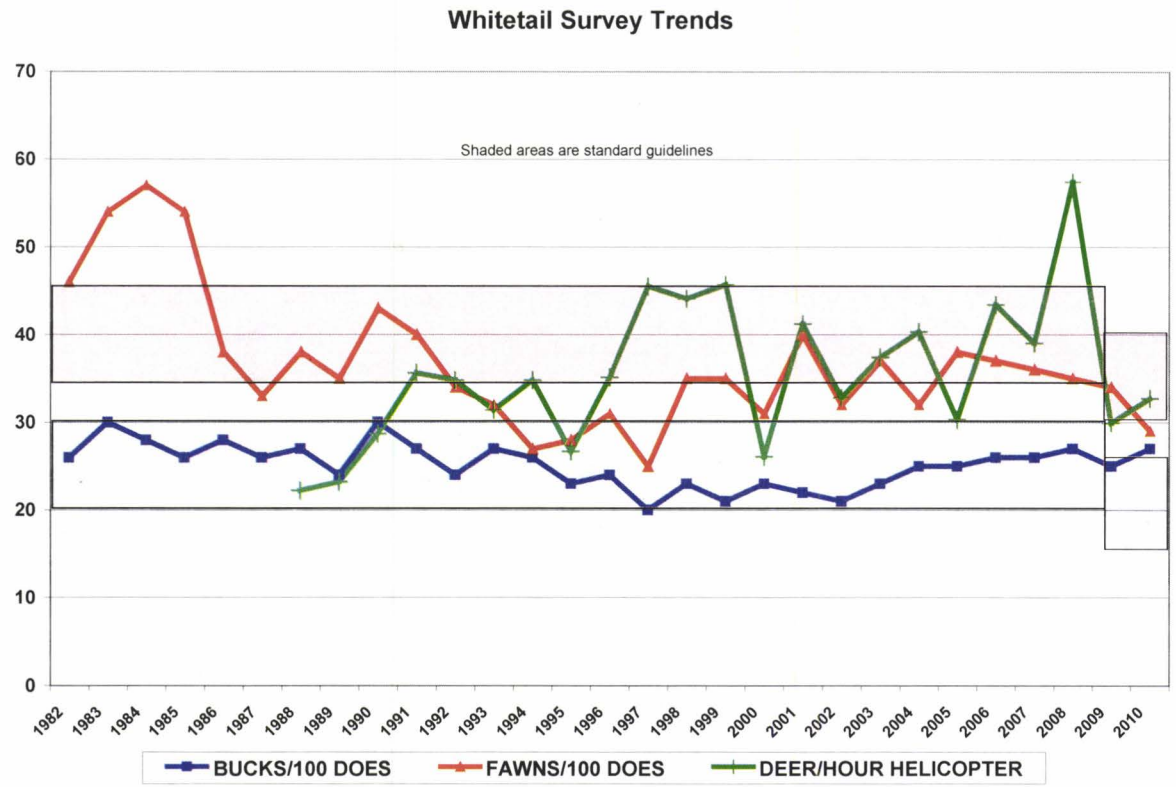
Monitoring Methods and Population Trends: The AGFD conducts annual surveys of white-tailed deer to determine annual recruitment in order to set hunting permit numbers for the following season. The data are collected on the basis of a game management unit, but the majority of whitetail habitat in southeastern Arizona is found on the CNF. The Coronado Forest Plan identifies 1,430,071 acres of occupied habitat for Coues white-tailed deer. The amount of occupied habitat has not changed significantly since 1986. Observational evidence tends to indicate that as mule deer populations decline, whitetails are moving into areas previously occupied by mule deer on the CNF (Gerhart, pers. obs.). In 1999 the Arizona Game and Fish Department (AGFD) estimated a total of 80,000 post-hunt adult deer in approximately 9000 square miles of habitat statewide (AGFD 1999). Statewide population trended slightly downward through the mid 1990's, but have recovered somewhat since then. This trend is thought to be related primarily to changes in the amount and timing of precipitation since the mid-1990's and the subsequent effects on fawn survival. White-tailed deer on the CNF have followed this trend. Since 1986, fawn survival has declined somewhat throughout southeastern Arizona, but white-tailed deer populations in 1986 were at near record high levels and probably above the long-term carrying capacity of the habitat (see figures below). Harvest levels (a rough surrogate for population levels) have trended upward since approximately 2001.

Since 1986, several large wildfires have occurred on the CNF in white-tailed deer habitat. These include the Redington and Rattlesnake Fires (1994), the Shovel Fire (1995), Clark Peak Fire (1996), Lone Fire (1999), the Ryan and Bullock Fires (2002), Aspen fire (2003) and the Nuttall Complex Fire (2004). It is anticipated that the effects of these fires will benefit white-tailed deer over the long term by opening up the forest canopy and creating a variety of seral stages.

Since 1986 when the CNF Plan was approved, average annual whitetail harvests have fluctuated in the vicinity of 3500 deer, but no clear trends are discernable (Figure 5).

Figure 5. White-tailed Deer Harvest Trends: 1982-2010





Evaluation. White-tailed deer were selected as an indicator of herbaceous cover and diversity. No targets for either of these characteristics were set in the CNF Plan. However, white-tailed deer habitat is of sufficient quality, distribution and abundance to allow species population to stabilize and to be well distributed across the CNF. Populations of the species have declined somewhat since 1986, primarily as a result of the effects of precipitation, but annual recruitment is still sufficient to provide a harvestable surplus averaging 3500 bucks per year in southeastern Arizona. Suitable habitats remain occupied throughout the Forest.

Information sources.

Arizona Game and Fish Department. Management Summary forms for white-tailed deer. Unpublished survey and harvest data on file in the Tucson Office. AGFD.Tucson.

Arizona Game and Fish. 1999b. Wildlife 2006. Arizona Game and Fish Department. Phoenix, Arizona. 91pp.

Ockenfels, Richard A., Daniel E. Brooks, and Charles H. Lewis. 1991. General ecology of Coues white-tailed deer in the Santa Rita Mountains. A final report. Arizona Game and Fish Department. Phoenix, Arizona. Research Branch Technical Report No. 6. 73pp.

Revised and updated: 6-15-2004 (RAG); 2-16-2005 (RAG); 05-04-2011 (RAG).

Pronghorn Antelope (Antilocapra americana)

Pronghorn is included in the Species Needing Herbaceous Cover and Game Species indicator groups. It was selected as an indicator for the Forest Plan because it inhabits plains and semi-desert grasslands with a diversity of forbs and grasses. It is sensitive to grazing, human development and fencing (USFS 1982).

Pronghorn inhabit the grasslands in the Sulphur Springs, San Rafael and San Bernardino Valleys and Altar Valleys and the Sonoita grasslands north of the Canelo Hills. In general, pronghorn populations in southeastern Arizona are found off of the CNF, with Forest lands providing seasonal or fringe habitats. The Forest Plan identifies 57,692 acres of occupied habitat for the Coronado National Forest (Table 16).

Table 16. Acres of occupied habitat for Pronghorn antelope in the Coronado National Forest Plan.

Vegetation Community	Habitat Acres
Desert grasslands	11,687
Plains grasslands	16,518
Broadleaf evergreen woodlands	21,788
Coniferous woodlands	5,890
Evergreen riparian	1,809
Total	57,692

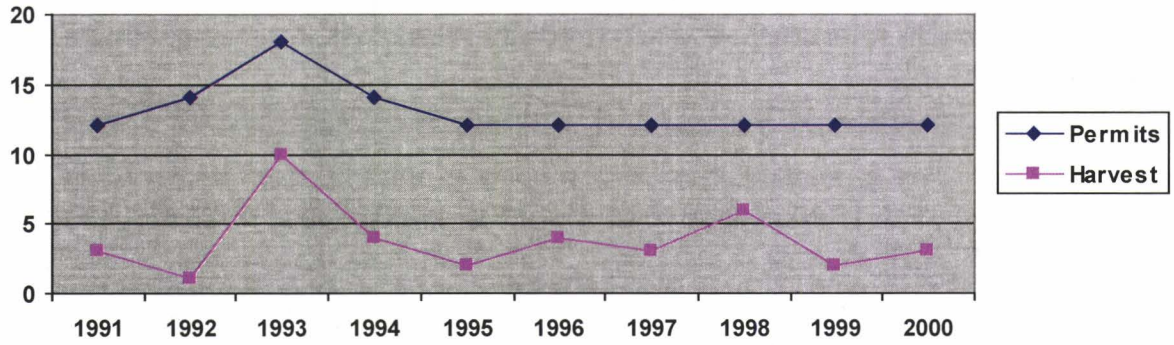
Monitoring Data and Population Trends. The Arizona Game and Fish Department conducts surveys for pronghorn on an annual basis. The following information is available for Units 35A and 35B.

Table 17. Survey information for pronghorn in Wildlife Management Unit 35A and 35B, 1987 to 2002 (*from*: John Millican, Arizona Game and Fish Department, unpublished)

	Population Estimate by Area					
	San Rafael Valley		Elgin		Total	
Year	*buck:does:fawns*	*total*	*buck:does:fawns*	*total*	*buck:does:fawns*	*total*
1987/1988	5:30:6	41	21:46:7	74	26:76:13	115
1988/1989	9:33:8	50	17:22:2	41	26:55:10	91
1989/1990	5:28:5	38	11:22:2	35	16:50:7	73
1990/1991	10:26:5	41	19:23:5	47	29:49:10	88
1991/1992	10:16:5	31	12:25:11	48	22:41:16	79
1992/1993	15:15:4	34	20:41:20	81	35:56:24	115
1993/1994	7:8:4	19	22:54:8	84	29:62:12	103
1994/1995	11:10:3	24	10:50:7	67	21:60:10	91
1995/1996	11:16:1	28	9:51:15	75	20:67:16	103
1996/1997	5:7:0	12	15:58:18	91	20:65:18	103
1997/1998	7:10:2	19	7:85:21	113	14:95:23	132
1998/1999	8:10:7	25	19:62:14	95	27:72:21	120
1999/2000	10:10:0	20	27:56:5	88	37:66:5	108
2000/2001	7:14:2	23	15:75:8	98	22:89:10	121
2001/2002	7:11:1	19	24:54:11	89	31:65:12	108

Units 35A and 35B include everything south of State Highway 82, west of the San Pedro River, and north of the Mexican border. Harvest and permit number trends for Unit 35A and 35B are presented in Figure 6, below.

Figure 6. Permit numbers and harvest trends for pronghorn in Wildlife Management Units 35A and 35B, 1991 to 2000 (*from*: Arizona Game and Fish Department, unpublished).



Pronghorn populations in southeastern Arizona were considered to be stable or slightly increasing through much of the 1990's. Recent poor fawn recruitment is thought to be causing a slight decline in total numbers. Numbers of animals in the San Rafael Valley herd have been declining over the past several years. Causes include periodic drought, possible poaching in nearby Mexico, and past over utilization of forage by livestock in other portions of the San Rafael Valley. Private land conversion from undeveloped to semi-residential "ranchettes" and attendant new fencing may be limiting the distribution of animals in the Elgin/Sonoita herd.

Evaluation. Management of pronghorn on the CNF is complicated by the fact that large areas of habitat are on private lands adjacent to the Forest. In general, habitat on the Forest is not of sufficient size or distribution to support a population of pronghorn without adjacent private or state parcels. While pronghorn might otherwise be a reliable indicator for herbaceous cover, populations on the CNF are significantly influenced by off-forest management and habitat conditions. This influence tends to mask the effects of Forest management on the species.

Information sources.

Arizona Game and Fish Department. Unpublished. Management summary forms for Pronghorn Antelope. AGFD Tucson AZ.

Revised and Updated: 5-2002 (RAG);
2-16-2005 (RAG)

Desert Bighorn Sheep (*Ovis Canadensis deserti*)

Desert bighorn sheep are listed in the Game Species and Threatened and Endangered Species groups in the Forest Plan. They were identified with (USFS 1982). Bighorn were endemic to the Pusch Ridge Wilderness Area (PRWA) of the Santa Catalina Mountains. It was selected as a management indicator because of its special habitat needs (rugged, open canopied mountains with scattered stands of grass and water) and sensitivity to dispersed recreation. The Forest Plan identified 72,458 acres of occupied habitat in (Table 18).

Table 18. Acres of occupied habitat for Desert bighorn sheep identified in the 1986 Forest Plan.

Vegetation Community	Habitat Acres
Southwestern desertscrub	15,829
Chaparral	3,227
Broadleaf evergreen woodlands	44,227
Coniferous forests (mixed conifer)	7,722
Dry desert riparian	125
Evergreen riparian	1,328
Total	72,458

Monitoring data and population trends. The Forest Plan identified the following items for monitoring bighorn in the Santa Catalina Mountains: Human effects, vegetation use and population trend (Appendix 1). A prescribed burn on the PRWA was accomplished in 1990 and effects were monitored by the University of Arizona in cooperation with the CNF. Over the past decade, the forest has supported research into the effects of human recreation on bighorn in the PRWA (Harris 1992, Schoenecker 1997, and others) and public attitudes toward wildlife (Devers 1999). The AGFD continued to fly helicopter surveys until 1997 when they were discontinued due to a lack of observations.

The bighorn population in the PRWA has declined over the past 15 years to the point where it is likely not viable. The reasons for the decline are the subject of a great deal of speculation and research, but it appears likely that a combination of urban encroachment, recreational disturbance, habitat fragmentation and predation are to blame. In 1996, the PRWA was closed to off-trail hiking and to dogs in an effort to minimize known disturbances to bighorn. This closure remains in effect.

Evaluation. The decline of the PRWA bighorn population was likely underway in 1986 when the Forest Plan was adopted. Recent habitat evaluations conducted by the AGFD indicate that suitable habitats persist on the PRWA, but that these habitats are being impaired by proximity to urban development and dense brush in portions of the range. The CNF, in cooperation with the AGFD, are continuing to evaluate the potential of an experimental release of bighorn back into the PRWA in order to determine habitat use, dispersal and limiting factors for bighorn on Pusch Ridge. Until the reasons for the decline of the population are more fully understood, and given the absence of population data, the species has low utility as a MIS.

Information sources.

Arizona Game and Fish Department. Desert Bighorn sheep survey and harvest data. Unpublished records on file at Arizona Game and Fish, Tucson AZ.

Harris, L.K. 1992. Recreation in mountain sheep habitat. Thesis, University of Arizona, Tucson, AZ.

Schoenecker, K.A. 1997. Human disturbance in bighorn sheep habitat, Pusch Ridge Wilderness, Arizona. Thesis, University of Arizona, Tucson, AZ.

Devers, P.K. 1999. Public attitudes, wildlife and recreation management in Pusch Ridge Wilderness, Arizona. Masters thesis, University of Arizona, Tucson, AZ.

Revised and updated: 5-2002 (RAG)

Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*)

The Mount Graham red squirrel is listed in the Threatened and Endangered Species group in the Forest Plan. This subspecies was listed as Endangered by the USFWS in 1987 (52 FR 20997). In 1982, when the Analysis of the Management situation was being developed, the status of the squirrel's population was poorly documented and it was not originally considered as a MIS (USFS 1982).

The Mount Graham red squirrel inhabits spruce-fir and mixed conifer forests at higher elevations of the Pinaleno Mountains on the CNF. Threats to the subspecies currently include habitat loss caused by cumulative effects of human activity, including recreational development, fire suppression and development of an astrophysical complex and potentially, competition from introduced tassel-eared squirrels (*Sciurus aberti*). Recently, insect and disease outbreaks in the Pinaleno Mountains have impacted occupied habitats by killing trees over large areas of occupied habitat.

Population trends. Long-term monitoring of red squirrel populations began in 1986 and has continued through to the present. Intensive monitoring of squirrel populations has centered on determining the impacts of the construction of the Mount Graham International Observatory. Much of this work has been carried out by the University of Arizona and has been reported by Young et al (2001). Additional monitoring throughout occupied habitats has been accomplished by the CNF and the AGFD in the form of semi-annual midden census. The results of 15 years of midden census were recently compiled by the CNF and are shown in Figure 7 and Table 19.

Figure 7. Trends in Mount Graham red squirrel population estimates, 1991-2001.

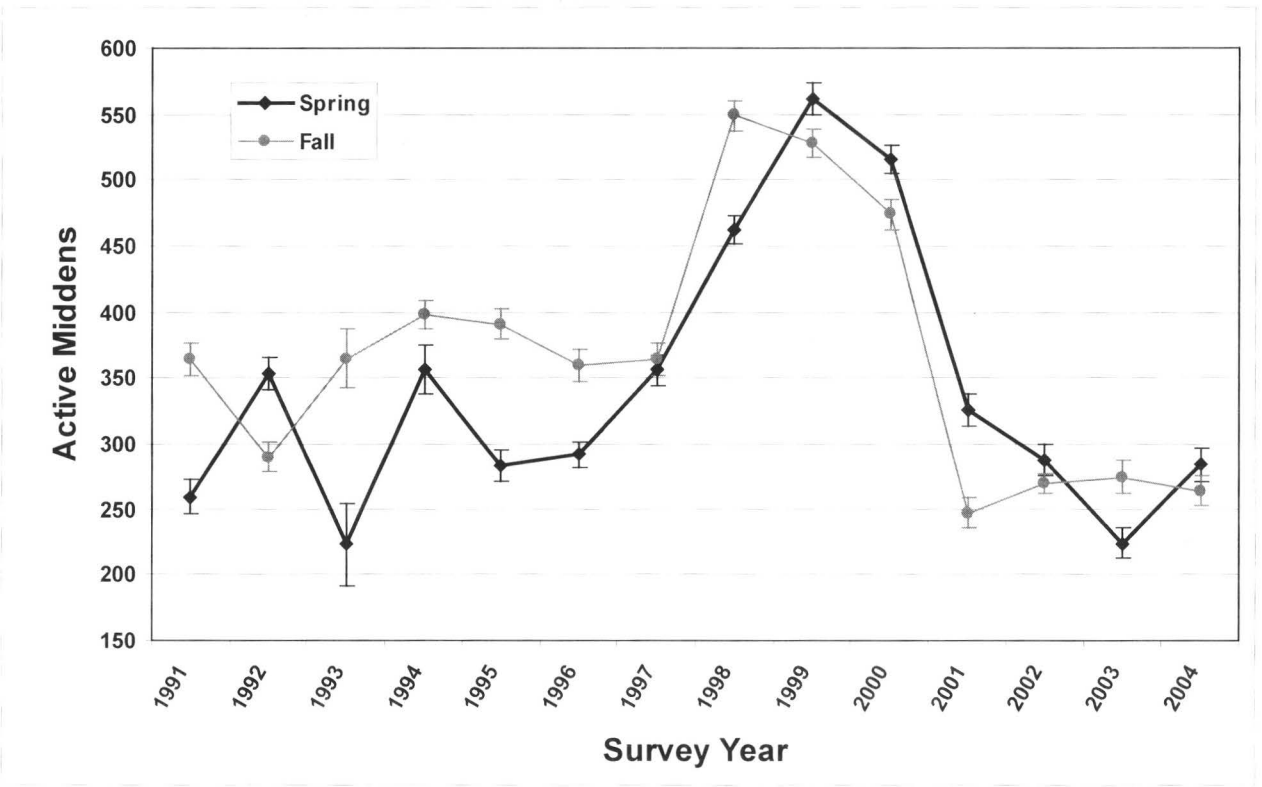


Table 19. Results of Mt. Graham Red Squirrel Population Estimates, 1986-2001

Survey	Sample Size	Conservative	Optimistic
Spring 86	207	348 +/- 55	
Fall 87	150	235 +/- 40	
Spring 88	45	210 +/- 62	
Fall 88	45	194 +/- 62	258 +/- 62
Spring 89	166	146 +/- 29	221 +/- 32
Fall 89	267	191 +/- 15	204 +/- 15
Spring 90	271	152 +/- 15	169 +/- 16
Fall 90	396	260 +/- 7	265 +/- 7
Spring 91	208	272 +/- 13	280 +/- 13
Fall 91	236	380 +/- 16	400 +/- 17
Spring 92	250	370 +/- 16	383 +/- 16
Fall 92	217	306 +/- 16	355 +/- 19
Spring 93	210	223 +/- 31	301 +/- 31
Fall 93	231	365 +/- 22	385 +/- 22
Spring 94	234	375 +/- 18	372 +/- 19
Fall 94	246	409 +/- 11	428 +/- 11
Spring 95	239	283 +/- 12	352 +/- 12
Fall 95	251	391 +/- 12	423 +/- 12
Spring 96	246	291 +/- 10	323 +/- 12
Fall 96	254	360 +/- 12	402 +/- 12
Spring 97	265	356 +/- 12	376 +/- 12
Fall 97	305	364 +/- 12	420 +/- 11
Spring 98	251	462 +/- 11	492 +/- 11
Fall 98	238	549 +/- 11	583 +/- 11
Spring 99	252	562 +/- 12	571 +/- 11
Fall 99	276	528 +/- 11	531 +/- 11
Spring 00	252	516 +/- 11	544 +/- 11
Fall 00	184	474 +/-12	491 +/-12
Spring 2001	259	326 +/-12	367 +/- 12
Fall 2001	263	247 +/-11	292 +/-11

Habitat Trends. Beginning in 1998, large numbers of mature spruce trees on Mount Graham began dying from a spruce beetle outbreak. As of the summer of 2004, at least 1,400 acres of mature spruce trees have been killed by beetles. This tree mortality has greatly reduced the ability of the area to support red squirrel populations. In June 2004, the Nuttall Complex wildfire burned 29,700 acres on Mount Graham, including areas providing red squirrel habitat. As a result, habitats for the squirrel on the mountain have been substantially reduced.

Evaluation. Habitats for the Mount Graham red squirrel remain occupied, but significant threats to the species continue in the form of insect and disease outbreaks and the potential for catastrophic fire. Monitoring of the species will continue into the foreseeable future, regardless of its status as MIS.

Information sources.

Young, P.J., V.L. Greer, J.E. Lowry, E. Bibles, N. Ferguson and E. Point. 2001. The Mount Graham Red Squirrel monitoring program: 1989-1998. The University of Arizona. Tucson, AZ.

Revised and updated: 5-2002 (RAG)
2-16-2005 (RAG)

Reptiles

Desert massassauga (*Sistrurus catenatus edwardsii*)

The Desert Massassauga is included in the Species Needing Herbaceous cover and Threatened and Endangered Species groups in the Forest Plan. It is also a Forest Service Sensitive species and is protected from collection by Arizona State law. It was selected as an indicator of high quality grasslands. It is sensitive to grazing and collection (USFS 1982). A total of 389 acres of occupied habitat was identified in the Forest Plan; however, there are no records that the species ever occurred on Forest lands (AGFD 2001). The massassauga is found primarily in tobossa (*Hilaria mutica*) grasslands in the San Bernardino Valley at the southeast corner of the Chiricahua Mountains. It is a small nocturnal rattlesnake that spends most of its time underground. It is active April to October (AGFD 2001).

Population and habitat trends. The species has not been found on the Forest so no estimate of population or habitat trends on the CNF is possible. Lowe et al (1986) speculate a stable population along Highway 80 in the San Bernardino valley based on a fairly constant number of road kills each year.

Evaluation. The massassauga is Arizona's most rare rattlesnake (Lowe et al. 1986). No conclusions can be drawn regarding massassauga populations on the Forest. There are no historic records from the Forest. As an indicator for habitats on the Forest, the species has no utility.

Information sources.

Lowe, C.H., C.R.Schwalbe, and T. B. Johnson. 1986. The venomous reptiles of Arizona. Arizona Game and Fish Department. Phoenix, AZ.

Revised and updated: 5-2002 (RAG)

Arizona Ridge-nosed Rattlesnake *(Crotalus willardi willardi)*

This species is included in the threatened and endangered species indicator group for the Forest Plan. It was noted during the planning process that the species could be potentially impacted by clear-cut logging and by mining in the Patagonia Mountains (USFS 1981). Habitat was described as bottoms and hillsides in evergreen oak and pine-oak woodland. The species is designated as a Forest Service Sensitive species, and is protected from collection by Arizona State law. Illegal collectors alter rock crevices and forest floors while searching for ridge-nosed rattlesnakes and remove an unknown number of individuals from the population.

The Arizona ridge-nosed rattlesnake is found in 4 mountain ranges in southeastern Arizona. Elevations for the species range from 4,800 to 9,000 feet. It is most often associated with broadleaf evergreen woodland, evergreen woodland, deciduous and evergreen riparian, and mixed and transition coniferous forest. Chaparral is used to a lesser extent. Microsites within these broader vegetation types include rock crevices, dense leaf litter, and bunchgrasses (Arizona Game and Fish 2001n; Johnson 1983). The Forest Plan identifies 28,175 acres of occupied habitat for the species on the Coronado National Forest (Table 20).

Table 20. Occupied habitat for Arizona ridge-nosed rattlesnake: 1986 Forest Plan.

Vegetation Community	Habitat Acres
Plains grassland	1,867
Broadleaf evergreen woodlands	14,642
Coniferous woodlands	2,766
Coniferous forests (transition)	7,401
Coniferous forest (mixed conifer)	1,279
Riparian	220
Total	28,175

Monitoring methods and population trends. Species population rankings are shown in the Arizona Heritage Database. On a global scale, the Arizona ridge-nosed rattlesnake is considered demonstrably secure with more than 100 occurrences. On a state scale, the species is apparently uncommon or restricted with 21 to 50 occurrences (Arizona Game and Fish 2001n).

Regional trend information for the Arizona ridge-nosed rattlesnake is not available and no systematic surveys are conducted for the species. A "general feeling" exists that it may be less common locally in the Huachuca Mountains than 25 years ago (Arizona Game and Fish 2001n).

Evaluation. Suitable habitats are extensive and abundant throughout the Huachuca, Santa Rita, Patagonia and Whetstone Mountains and Canelo Hills where the species has been documented. Commercial logging does not occur to any extent within occupied habitats and is not considered a factor. Potential habitats exist in the Chiricahua Mountains where the species has not been detected. Habitat appears to be of sufficient quality and distribution to allow the species to be well distributed; however, because of its secretive and inconspicuous nature, the snake is difficult to monitor on a large scale. Habitat, population and life history studies for the species continue to be needed.

Information sources.

Arizona Game and Fish. 2001n. *Crotalus willardi willardii*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 4pp.

Lowe, C.H., C.R.Schwalbe, and T. B. Johnson. 1986. The venomous reptiles of Arizona. Arizona Game and Fish Department. Phoenix, AZ.

Twin-spotted Rattlesnake (*Crotalus pricei*)

This species is included in the threatened and endangered species indicator group for the Forest Plan. The snake and its habitat are also impacted by illegal collecting (U.S. Forest Service 1981). It was not selected as a habitat indicator. It is locally common on talus slopes in ponderosa pine, aspen and mixed conifer, generally above 8,000 feet in elevation. The Forest Plan identifies 46,351 acres of occupied habitat on the CNF (Table 21).

Table 21. Occupied habitat for Twin-spotted rattlesnake by vetation type: 1986 forest plan.

Vegetation Community	Habitat Acres
Mountain grassland/meadows	314
Broadleaf evergreen woodlands	3,945
Coniferous woodlands	2,766
Coniferous forests (transition)	21,145
Coniferous forests (mixed conifer)	10,587
Coniferous forests (spruce-fir)	7,585
Total	46,351

The twin-spotted rattlesnake inhabits high elevation rock outcrops and talus slopes generally on south facing slopes in coniferous forests in at least 4 mountain ranges in southeastern Arizona (Lowe et al 1986). It can frequent open grassy forest floors and rock outcroppings in the adjacent oak woodland (Tom Deecken, District Biologist, pers. obs.). Other vegetation units, such as chaparral and evergreen woodland are probably used to an unknown extent. Twin-spotted rattlesnakes are protected from collection by Arizona State law, although illegal collecting removes an unknown number of individuals from the population each year. Collectors also alter rock crevices and forest floors while searching for twin-spotted rattlesnakes.

Population trends. Annual surveys are conducted in the Chiricahua Mountains. Species population rankings are shown in the Arizona Heritage Database. On a state scale, the species is uncommon or restricted with 21 to 50 occurrences in Arizona. It is fairly common in a rather restricted range within the state (Arizona Game and Fish 2001o).

Evaluation. Habitats for Twin-spotted rattlesnakes are relatively secure on the CNF. Much of the occupied habitat is located within designated wilderness where ground-disturbing activities are limited. The greatest threat to the species remains habitat alteration and removal of individuals by illegal collectors. While no quantitative data on population or habitat trends exists, historic habitats appear to remain occupied.

Information sources.

Arizona Game and Fish. 2001o. *Crotalus pricei*. Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Lowe, C.H., C.R.Schwalbe, and T. B. Johnson. 1986. The venomous reptiles of Arizona. Arizona Game and Fish Department. Phoenix, AZ.

Amphibians

Western Barking Frog (*Eleutherodactylus augusti cactorum*)

This species is in the threatened and endangered species group for the Forest Plan but is not an indicator for a specific habitat type. Forest planning records indicate that it was considered "...little impacted by anything. Too secretive and difficult to census to be an indicator species" (U.S. Forest Service 1981). Nevertheless, it was included in the MIS list in the AMS where it was described as sensitive to mining, quarrying and water draw down. It is also designated as a Forest sensitive species.

The western barking frog often frequents crevices in limestone or rhyolite rock outcrops on hillsides within the Madrean evergreen woodlands. Elevations range from 5,200 to 6,200 feet. Within the CNF, they have been documented in the Huachuca, Pajarito and Santa Rita Mountains. The Forest Plan shows 891 acres of occupied habitat for the species in Broadleaf evergreen woodlands and Evergreen riparian vegetation types.

Population trends. On a global scale, the western barking frog is considered apparently secure with more than 100 occurrences, though it could be quite rare in some areas. The subspecies, *cactorum*, however, is considered uncommon or restricted with 21 to 100 occurrences. On a state scale, the species is very rare with 1 to 5 occurrences in Arizona or very few individuals or acres (AGFD 2001). Goldberg and Schwalbe (2000) studied various aspects of population ecology for the species on the nearby Coronado National Memorial during 5 years of work up to 2000. At 2 sites, densities of 27 and 5 frogs per 2 hectares areas were recorded. Theses densities were based on capture and recapture ratios over the study period on isolated limestone outcrops.

Habitat Trends. Limestone and rhyolite rock outcrops are common and well distributed throughout the Forest, although no attempts have been made to quantify their extent. These habitats are not affected to any degree by management activities and are assumed to be present in the same amount as in 1986.

Evaluation. Western barking frogs are highly secretive and have proven to be quite difficult to monitor. Because of their narrow habitat preferences (limestone outcrops), they are not well suited as indicators of larger habitat areas. There are no known threats to existing habitats. The few known populations appear to be persisting, but populations are small and isolated, so stochastic events could threaten their persistence (Goldberg and Schwalbe 2000). The Forest should continue to support research and monitoring efforts in order to gain insights into the size and distribution of populations, but the species is not well suited as a MIS.

Information sources.

Arizona Game and Fish. 2001k. *Eleutherodactylus augusti cactorium.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 4pp.

Goldberg, Caren S. and Cecil R. Schwalbe. 2000. Population ecology of the barking frog. Arizona Game and Fish Department Heritage Fund IIPAM Project No. I98014. 50pp.

Revised and updated: 5-2002 (RAG)

Mountain (Arizona) Tree Frog *(Hyla wrightorum)*

This species (Arizona tree frog, *Hyla eximia*, in the forest Plan) is in the Threatened and Endangered group but is not an indicator for an identified habitat type. Forest Planning records indicate that the species is sensitive to non-native species introduction, water draw down and activities affecting water quality (USFS 1982). However, the Arizona tree frog was not considered a good indicator species because of its extremely limited distribution (U.S. Forest Service 1981). The Forest Plan gives no data for acres of occupied habitat for the Coronado National Forest.

The species occurs in the mountains of central Arizona and southwestern New Mexico south through the Sierra Madre Occidental to central Mexico (Degenhardt et al 1996). On the CNF, it has been found in only a few locations in the Huachuca Mountains at elevations of 4,920 to 6,560 feet in evergreen woodland and riparian areas in pine-oak woodland (Sredrl and Wallace 2000).

Population Trends. On a global scale, the Arizona tree frog is considered apparently secure with more than 100 occurrences, though it could be quite rare in some areas. There is some question, however, on the taxonomic validity of the species and the global rank may change in the future. On a state scale, the species is apparently secure with more than 100 occurrences although it could be quite rare in some areas. Holm and Lowe (1995) reported the species was persisting in one pool in Scotia Canyon in 1993. No monitoring of this species is accomplished on the CNF and no conclusions regarding population trend can be drawn. There are at least 4 observations for Arizona tree frogs from the Huachuca mountains (Arizona Game and Fish 2001; Eric Wallace, pers. comm.; Tom Deecken, pers. obs.).

Habitat Trends. The species uses permanent and semi-permanent seeps and pools in canyon bottoms. These habitats have persisted and are not affected significantly by management.

Evaluation. Because of its extremely limited distribution on the CNF, it is important to maintain existing occupied habitats. However, the Arizona tree frog has limited value as a Forest-wide management indicator because of its small population size and extremely limited distribution.

Information sources.

Arizona Game and Fish. 2001. *Hyla eximia.* Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Dagenhardt, William G. et al. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press. Albuquerque, New Mexico. 430pp.

Sredl, Michael J. and J. Eric Wallace. 2000. Management of the amphibians of Fort Huachuca, Cochise County, Arizona. Arizona Game and Fish Department. Phoenix, Arizona. Department of Defense Contract DABT63-95-P-2237. Nongame and Endangered Wildlife Program. Technical Report 166. 34pp.

Holm, P.A. and C.H. Lowe. 1995. Status and conservation of sensitive herbetofauna in the Madrean riparian habitat of Scotia Canyon, Huachuca Mountains, Arizona. Report submitted to Arizona Game and Fish Department. Phoenix, AZ.

Revised and updated: 5-2002 (RAG)
2-16-2005 (RAG)

Sonora Tiger Salamander (*Ambystoma tigrinum stebbinsi*)

This species was included in the threatened and endangered species indicator group for the Forest Plan because of its limited distribution and sensitivity to the introduction of non-native species (USFS 1982). The Sonora tiger salamander inhabits the plains grassland, oak woodland, and pine-oak woodland of the upper Santa Cruz and San Pedro Rivers. The Forest Plan shows 640 acres of occupied habitat for the Coronado National Forest in the Broadleaf evergreen woodlands. Elevations range from 5200 feet near the Mexican border to 6200 feet in upper Scotia Canyon.

Populations consist of aquatic larva, adult branchiates, and terrestrial adult metamorphs. Threats to the species include predation (primarily by nonnative fish and bullfrogs), disease, floods, drought, illegal collecting, introduction of other subspecies of tiger salamanders that could genetically alter the Sonora tiger salamander, trampling of larva, adults, and eggs by livestock, siltation of stock ponds, and use of water from stock ponds for fire suppression. Cleaning out stock ponds is necessary for livestock operations and salamander habitat but could result in mortality of adults, larva, and eggs and loss of shoreline cover.

In 1997, the Coronado National Forest and the U.S. Fish and Wildlife Service developed a management plan for stock ponds in salamander habitat. This plan was part of the terms and conditions in the biological opinion on Forest plans and long-term grazing (U.S. Fish and Wildlife Service 1998, 1999). These guidelines were incorporated into the 1998 annual operating plans for all allotments in salamander habitat. A recovery plan for the species is currently being prepared.

Population trends. Species population rankings are shown in the Arizona Heritage Database (Arizona Game and Fish 2001). On a global scale, the Sonora tiger salamander is considered rare to very rare with less than 20 occurrences. On a state scale, the species is rare to very rare with less than 20 occurrences in the Arizona or few individuals or acres.

As of 1999, there were 53 sites with salamander populations (Arizona Game and Fish 2001m), all of which are located in the San Rafael Valley. The Arizona Game and Fish Department over the last 3 years has expended the number of locations for the species through sampling stock ponds. Dr. James Collins and associates (Arizona State University) have also been actively studying the species for several years. Comprehensive trend information is not available for the Forest. Determining population status is further complicated by the ability of the subspecies to take advantage of available breeding areas that at times may be dry (Arizona Game and Fish 2001). Poorly understood are the dispersion mechanisms for the species away from occupied sites as well as the importance of animal burrows and downed logs (U.S. Fish and Wildlife Service 1997).

Habitat Trends. All stock ponds within the known range represent occupied or potential habitat. The number of stock ponds has not changed significantly since 1986; however, the implementation of the stock pond maintenance guidelines has allowed for the maintenance of suitable sites that would have otherwise silted in and been lost as suitable habitat. There are currently more occupied sites than were known in 1986, but this is likely due to more intensive survey efforts rather than any increase in habitat quantity.

Evaluation. In general, existing Sonora tiger salamander habitat only allows continued existence in refugia restricted to the San Rafael Valley. At present the species occurs only in man-made

stock ponds. The species continues to be threatened by hybridization with other salamanders, predation by nonnative fish and bullfrogs, illegal collection for bait by anglers and disease (USFS 1999). These threats are exacerbated by the increased probability of random extirpation characteristic of small populations (USFS 1999, AGFD 2001). Habitat destruction and grazing-related population loss on the Forest have been mitigated by incorporation of the salamander guidelines into grazing plans. Most historic habitats remain occupied and several new populations have been discovered, but because of the lack of good historic survey data, population trend assessment is problematic.

Information Sources.

Arizona Game and Fish. 2001m. *Abystoma tigrinum stebbinsi*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 5pp.

U.S. Fish and Wildlife Service. 1997. Endangered and threatened wildlife and plants; determination of endangered status for three wetland species found in southern Arizona and northern Sonora, Mexico. Federal Register 62(3):665-689.

U.S. Fish and Wildlife Service. 1998. Biological opinion and conference opinion. Land and Resource Management Plans, as amended, for Eleven National Forests and National Grasslands in the Southwestern Region. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. File Designation Region 2/ES-SE. 130pp + Attachments.

U.S. Fish and Wildlife Service. 1999. Biological opinion. On-going and long-term grazing on the Coronado National Forest. U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office. Phoenix, Arizona. AESO/SE 2-21-98-F-399. 376pp.

Revised and updated: 5-2002 (RAG)
2-15-2005 (RAG)

Tarahumara frog (*Rana tarahumarae*)

The Tarahumara frog is listed in the threatened and endangered species group of the Forest Plan. It was identified in planning material in the Forest files as a potential MIS, but was considered a poor indicator species since populations were declining. Nevertheless, it was included in the final Forest Plan. Six historically occupied sites are found on the CNF. Although the last known individual frog was found dead in 1983 (Hale 1992), the 1986 Forest Plan inexplicably identifies 1,339 acres of occupied habitat on the Forest. Habitats include boulder strewn perennial streams and seasonal streams with bedrock beds that include deep drought resistant plunge pools.

The species was extirpated from Arizona in 1983. Causes of the population decline and extirpation are speculative. They include competition and predation by non-native fish and bullfrogs, drought, pollution and the fungal disease chytridiomycosis, among others (Hale 1992, Demlong 1999). The species remains extant in several locations Mexico. Beginning in June 2004, Tarahumara frogs were released at several sites in Santa Rita Mountains, Nogales Ranger District through an effort developed by the Tarahumara Frog Conservation Team using captive-bred frogs raised from larvae collected in the wild in Mexico and raised at the Kofa National Wildlife Refuge (Field, et al 2002).

Population trends. Reintroduced populations have been monitored several times since the re-establishment efforts in order to determine survival, dispersal and reproduction (Rorabaugh 2004 a, b, c, 2005 and Sredl 2004a, b). The data are not sufficient to determine long-term survival or population trends; however, introduced frogs have persisted through the summer and in to the winter dormant season.

Habitat Trends. A survey of historical and potential habitats was undertaken in 1991 in an effort to provide background information for potential reintroduction efforts (Hale 1992). This survey identified potential habitats in at least three historic sites (Big Casa Blanca, Gardner and Sycamore Canyons). The persistence of these sites was confirmed by the Tarahumara Frog Conservation Team in 2000 (Field, et al 2002). Although the amount of habitat was not quantified, it appears that potential habitats available in 1986 have persisted into the present.

Evaluation. Tarahumara frogs were rare and declining on the CNF when the Forest Plan was being drafted. They were extirpated by the time the plan was adopted. Suitable habitats within the species' historic range continue to be limited on the Forest, but have persisted over time and do not appear to be affected by management. Amphibians in general and ranid frogs in particular are subject to periodic population declines from unknown causes apparently unrelated to management. Reestablished populations have been and will continue to be monitored, but population trends are likely influence by factors other than habitat condition. For these reasons, the species currently has limited utility as a MIS.

Information sources.

Demlong, M. 1999. Special announcement – a proposal to reestablish the Tarahumara frog, *Rana tarahumarae*, in the Santa Rita and Pajarito-Atascosa Mountains. Sonoran Herpetologist. 12(7) 1999. 2 pp.

Field, Kimberly J., M.J. Sredl, R.C. Averill-Murray and T.B. Johnson 2002. A Proposal to Re-Establish Tarahumara Frogs (*Rana tarahumarae*) into Southeastern Arizona. Technical Report 201, Arizona Game and Fish Department, Nongame and endangered wildlife program. Phoenix, AZ.

Hale, S.F. 1992. A survey of historical and potential habitat for the Tarahumara frog (*Rana tarahumarae*) in Arizona. Special report prepared for the Arizona Game and Fish Department and the Coronado National Forest. Arizona Game and Fish Department. Phoenix, AZ. 42 pp.

Revised and updated: 5-2002 (RAG)
2-15-2005 (RAG)

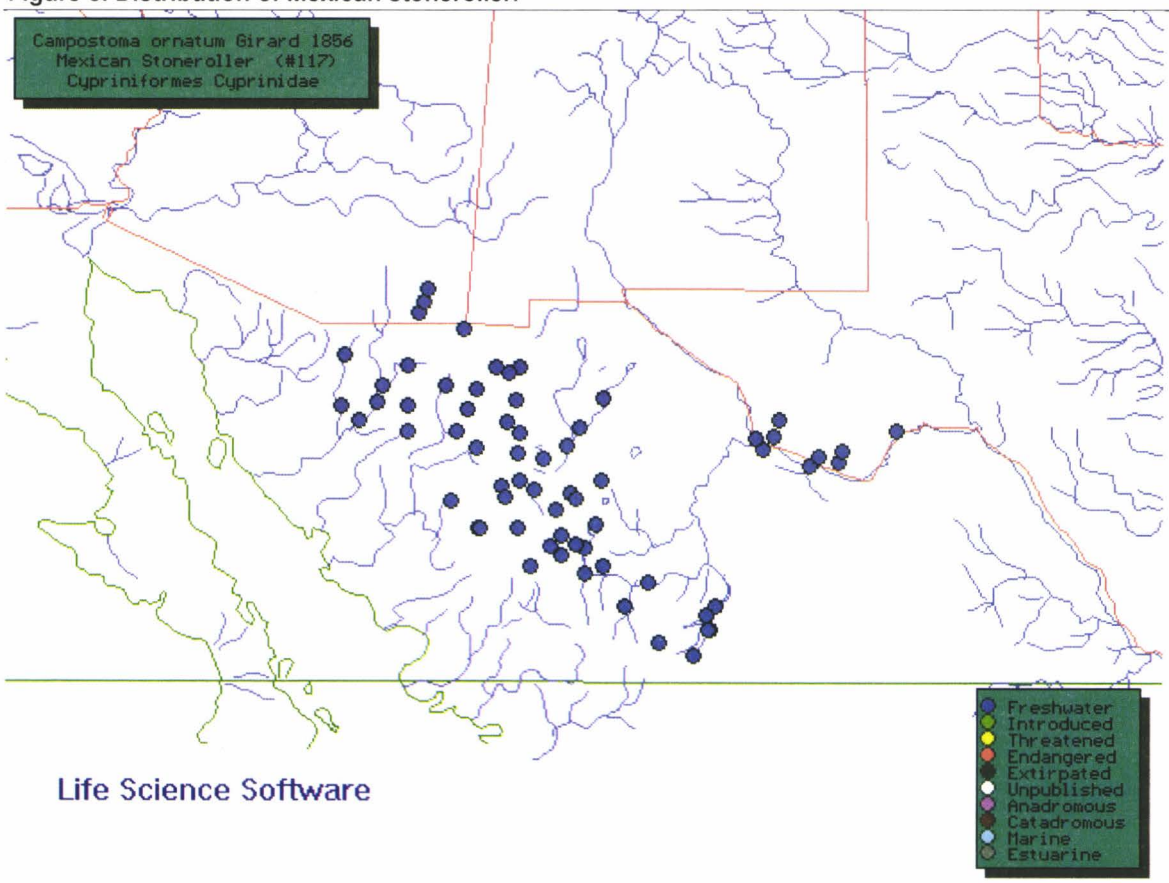
Fish

Mexican stoneroller (*Campostoma ornatum*)

The Mexican stoneroller is listed in the Threatened and Endangered Species group in the Forest Plan. It is also a Forest Service Sensitive species. The reasons for including this species are not evident in the record, except that it was noted at the time that research on the species was lacking (USFS 1981). It is not identified with a specific habitat type in the Forest Plan.

Mexican stonerollers occur throughout the Rio Yaqui drainage in Mexico, in tributaries of the Rio Grande River and south through Sonora Chihuahua and Durango Mexico (Figure 7). In Arizona, it occurs only in Rucker Canyon in the Chiricahua Mountains on the CNF (AGFD 2001). The Forest Plan identified 3.3 miles of occupied habitat for the species. Threats include changes in habitat quality and the presence of non-native predatory fish within Rucker Creek.

Figure 8. Distribution of Mexican stoneroller.



Monitoring data and population trends. Periodic electrofishing surveys have been accomplished over the years, the most recent having been done in June of 2001. Mexican stonerollers have been detected in all surveys. In 1994, the Rattlesnake fire affected nearly half of the Rucker Canyon watershed. Post-fire sediment yield increased dramatically, depositing up to 30 inches of sediment in some portions of the stream channel and completely filling Rucker Lake (LeFevre 1999). The species has declined drastically as a result, but persists in small numbers within the canyon in spite of severe habitat alteration. Like many desert fishes, Mexican stoneroller populations appear to fluctuate dramatically over time in response to changing stream conditions.

Evaluation. Mexican stonerollers occur only in Rucker Canyon. Populations within the canyon have persisted and suitable habitats remain occupied in spite of dramatic habitat alteration. Because of the species rarity and extremely limited distribution, monitoring should continue.

Information sources.

Arizona Game and Fish Department. 2001. *Campostoma ornatum*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

Apache (Arizona) trout (*Oncorhynchus apache*)

The Apache trout is included in the Threatened and Endangered Species indicator group in the Forest Plan. Apache trout are native to the White Mountains in the headwaters of the Little Colorado, Black and White Rivers. Currently listed as Threatened and a Forest Service Sensitive species, recovery activities have been aimed at establishing new populations within historic range. An introduced population has been established since the 1960's in the Pinaleno Mountains in several creeks including Ash and Marijilda and Grant Creeks. Recent genetic work has determined that these populations have at least partially hybridized with stocked rainbow trout in all of these streams (Neilson et al.1999). There are no records of native trout on the CNF.

Population trends. The Arizona Game and Fish Department surveyed streams in the Pinaleno Mountains in 1989, 1990 and 1997. No population trends are apparent for the hybridized populations in the Pinaleno Mountains, but suitable stream habitats are apparently occupied. Within its native range in the White Mountains, the introduction of non-native salmonids and habitat degradation have led to a range reduction (AGFD 2001). Recovery activities are underway throughout Arizona aimed at stream reclamation and re-establishment of native trout populations. Habitats on the CNF are not considered suitable for this effort because of genetic contamination.

Habitat Trends. The species was not listed as a habitat indicator. The 2004 Nuttall Complex fire resulted in high sediment flows in Marijilda Creek and likely resulted in the loss of habitats in that stream. Other habitats in Grant Creek and Ash Creek were largely unaffected by the fire.

Evaluation. Hybridized populations of Apache trout are persisting in occupied habitats on the CNF. It seems likely, but is not certain, that the species was originally selected as an MIS because it was though to have potential in helping to achieve recovery plan goals. The fact that all populations on the CNF are to some degree hybridized with Rainbow trout reduces this potential. The species is not native and habitat is only sufficient to allow the species to persist in the few creeks where it was stocked. Population trends are difficult to detect and provide little insight into the effects of forest management.

Information sources.

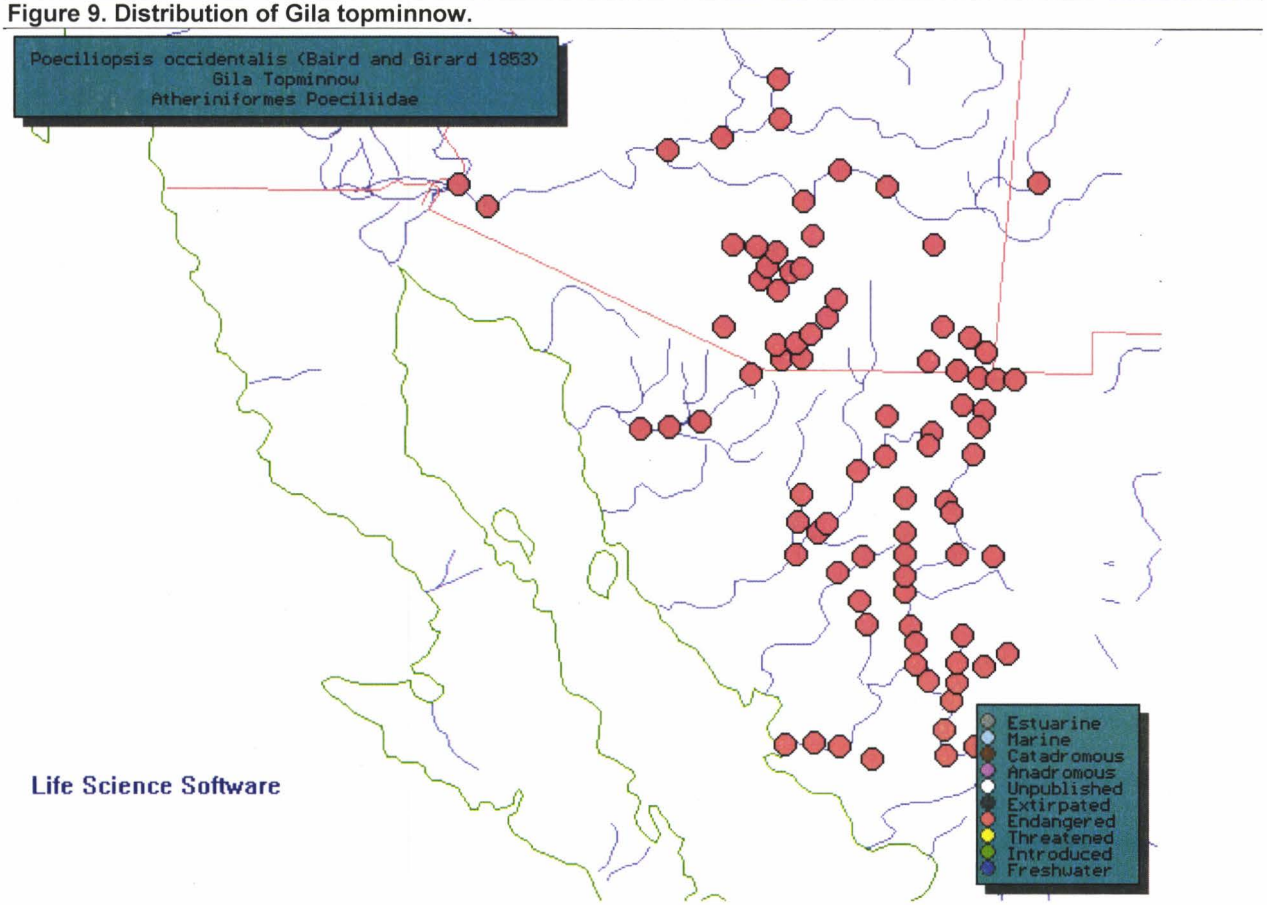
Arizona Game and Fish Department. 2001. *Onchorhynchus apache*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

Nielson, J.L., D. Wiltse and M. Fountain. 1999. Testing for rainbow trout introgression in Arizona Apache trout populations using microsatellites. Report submitted to Arizona Game and Fish. USGS/BRD Alaska Biolological Science Center. Anchorage. 24 pp.

Gila topminnow (*Poeciliopsis occidentalis occidentalis*)

This species is included in the threatened and endangered species indicator group for the Forest Plan because its relationship to the quality of the riparian and absence of mesquitofish (U.S. Forest Service 1981). It is listed Endangered by the USFWS. The Forest Plan lists 4.5 miles of occupied habitat for the species. It currently occurs only in the Redrock Canyon drainage on the CNF.

Figure 9. Distribution of Gila topminnow.



Population trends. Fish populations in Redrock Canyon have been monitored annually in the autumn since 1989 (Stefferud 2001). The results have been reported by Stefferud and Stefferud (1995), USDA Forest Service (1998) and Weedman and Young (1997). Topminnows have been consistently found in the Canyon since sampling began in 1988, although populations have fluctuated widely.

Habitat Trends. Stefferud (2001) reported the results of long term habitat monitoring in Redrock Canyon to track changes that have occurred as a result of implementation of the Redrock Riparian Improvement Plan and other activities. He concluded that substantial improvements in the riparian and aquatic plant community have occurred over the past decade, especially in areas where livestock had been excluded. Stefferud did not estimate the miles of occupied habitat, but he concluded that the livestock exclosures have increased the extent of surface water over time.

Evaluation. Gila topminnows remain restricted to a single canyon on the CNF. However, it appears that over time changes in management have increased the amount of suitable habitats for the species within the canyon. While the species remains extremely limited in distribution on the CNF, its apparent responsiveness to management and large quantity of monitoring data available make it well suited as a management indicator for a limited habitat type and area (aquatic conditions in Redrock Canyon). It is unlikely that the species will ever be well distributed across the Forest in the foreseeable future, so it will remain susceptible to stochastic events that potentially could significantly impact the lone population.

Information sources.

Stefferud, J.A. 2001. Redrock Canyon photo point and aquatic habitat survey. Sierra Vista Ranger District, Coronado National Forest, Santa Cruz Co. USDA Forest Service, Tonto National Forest, Phoenix.

Stefferud, J.A. and S.E. Stefferud. 1995. Status of Gila topminnow and results of monitoring the fish community in Redrock Canyon, Coronado National Forest, 1979-1993. Pages 361-369 in L.F. DeBano, G.J. Gottfried, R.H. Hamre, C.B.Edminster, P.F. Ffolliott, and A. Ortega-Rubio, editors. Biodiversity and management of the Madrean Archipelago: the sky islands of southwestern United States and northwestern Mexico. September 19-23, 1994, Tucson, Arizona. USDA Forest Service, Gen. Tech. Rep. RM-GTR-264, Fort Collins, Colorado.

USDA Forest Service. 1998. Biological assessment of on-going and long-term grazing on the Coronado National Forest. USDA Forest Service, Coronado National Forest, Tucson, Arizona.

Weedman, D.A. and K.L. Young. 1997. Status of Gila topminnow and desert pupfish in Arizona. Nongame and Endangered Wildlife Program Technical Report 118. Arizona Game and fish Department, Phoenix, Arizona.

Revised and updated: 5-2002 (RAG)
2-14-2005 (RAG)

Gila chub (*Gila intermedia*)

This species is included in the threatened and endangered species indicator group for the Forest Plan because it is established in selected locales on the Forest. Distribution information, however, was incomplete at the time the Forest Plan was published (U.S. Forest Service 1981). The species is currently proposed for listing under the Endangered Species Act. There were 4.4 miles of occupied habitat identified in the Coronado National Forest Plan. On the CNF the species occurs in Sabino and O'Donnell Creeks.

Population trends. Arizona Game and Fish biologists monitored chubs in Sabino Canyon annually through 2003. While no population estimates were made, populations of fish were consistently been found in the same areas each year. In the summer of 2003, the Aspen fire burned nearly the entire Sabino Creek watershed. Resulting debris flows in the canyon substantially modified aquatic habitats and eliminated all aquatic vertebrates in the canyon. In anticipation of these flows, several hundred Gila chub were salvaged from the creek prior to the flooding and are being held in captivity. Planning is underway to reestablish populations once conditions improve.

Populations of introduced green sunfish are suspected to limit the distribution of Gila chub through competition and predation. In 2000, the CNF and the AGFD cooperated in a successful effort to renovate the downstream portion of Sabino Canyon in order to remove green sunfish. As a result of this effort, habitats in Sabino Canyon were considered to be improving until 2003.

In 2002, a similar renovation effort was undertaken in O'Donnell Creek, resulting in the successful removal of green sunfish from the stream.

Habitat Trends. The species was not selected as an indicator of a specific habitat. However, occupied habitats in Sabino canyon have been at least temporarily reduced as a result of post-fire flooding and siltation of the stream channel.

Evaluation. Although historically more widespread, Gila chub are restricted to a few sites throughout Arizona including Sabino Canyon and O'Donnell Creek on the CNF. Populations expand and contract naturally over time as climatic events affect aquatic habitats, but long-term trends are downward throughout the species' range (AGFD 2001). On the CNF, historic habitats remained occupied and, until 2003, were considered to be expanding as management efforts eliminate populations of green sunfish from chub habitats. Because of the limited distribution of the species and isolation of the populations, random environmental events could potentially eliminate local populations, as has occurred in Sabino Canyon.

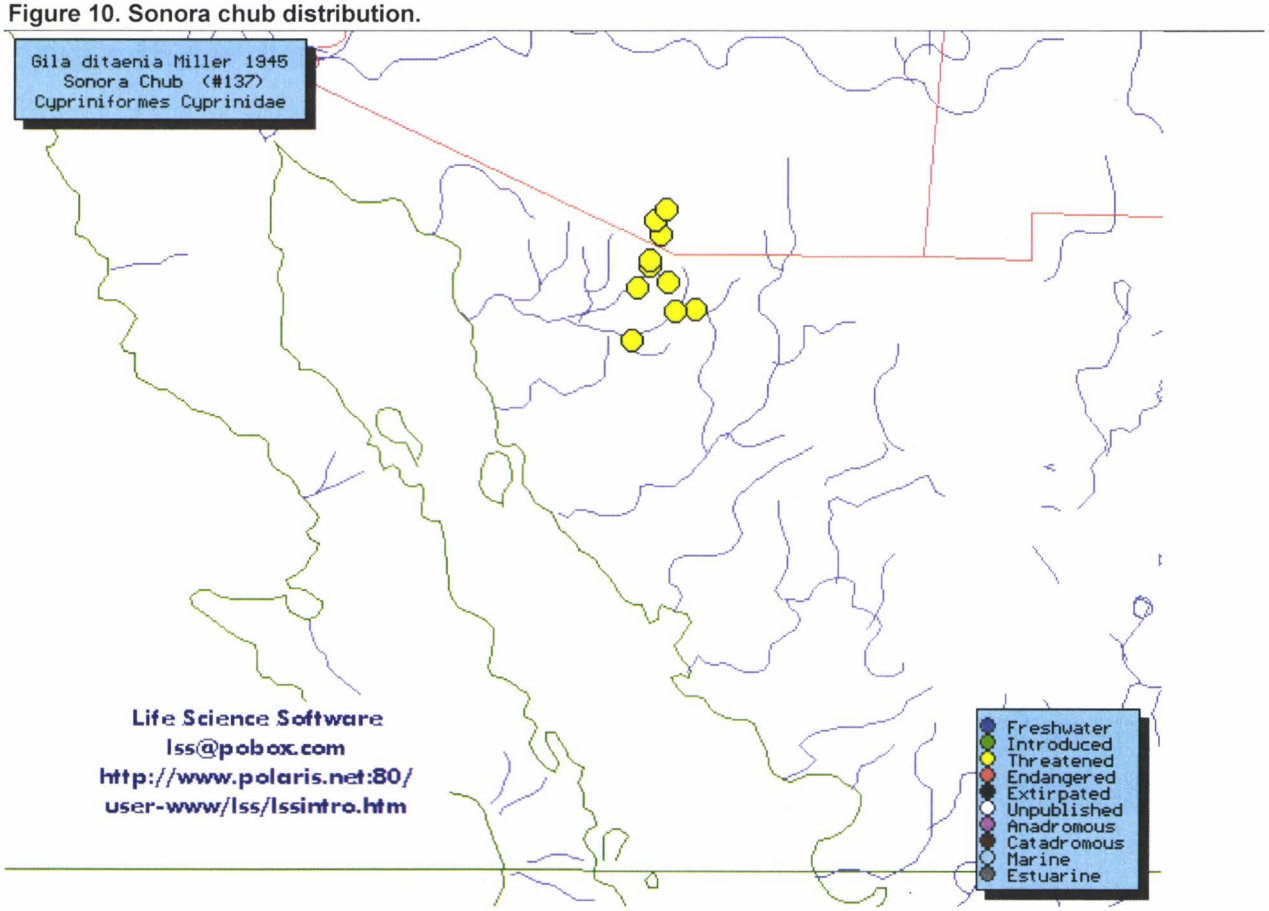
Information sources.

Arizona Game and Fish. 2001q. *Gila intermedia*. Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Sonora chub (*Gila ditaenia*)

The Sonora chub is included in the Threatened and Endangered Species indicator group in the Coronado Forest Plan. It is listed as Threatened by USFWS with critical habitat (USFWS 1992). It is endemic to the Rio de la Concepcion drainage of Mexico and southern Arizona. Within Arizona, it occurs only in Sycamore Canyon and California Gulch on the Nogales Ranger District of the CNF. Critical Habitat is designated within portions of Sycamore Canyon. There is no Critical Habitat in California Gulch. Records in the Forest files (USFS 1981) indicate that it was considered susceptible to impacts from mining and predation by green sunfish (*Lepomis cyanellus*). The Forest Plan lists 3.7 miles of occupied habitat in 1986.

Figure 10. Sonora chub distribution.



Habitat on the CNF is at the edge of the species range and is isolated from other populations in Mexico (AGFD 2001). The watershed of Sycamore creek has been highly modified by human activities including mining, grazing, recreation and the introduction of exotic green sunfish.

Population trends. Since 1997, the District Biologist has conducted annual inventories of the number of pools and occupancy by chubs (Table 22). As is the case with many desert fishes, populations of Sonora chub have fluctuated widely over time. Especially in California Gulch, the amount and distribution of Sonora chub habitat changes dramatically on a regular basis. This dynamic makes it difficult to detect long-term trends, but Sonora chub populations have persisted over time. Different sizes of Sonora chub are present in annual surveys; reproduction seems to be sufficient to populate the available habitat.

Table 22. Sonora chub survey results, 1997-2001.

	1997	1998	1999	2000	2001
No. of pools/runs	112	76	114	86	146
Percent of pools occupied by fish	83	87	79	85	96

Habitat Trends. The species was not selected as an indicator of a specific habitat. Occupied sites within Sycamore Canyon and California gulch have persisted over time, with large fluctuations within and between years.

Evaluation. Habitat for Sonora chub remains limited to two canyons within one watershed on the Forest. The species distribution is similar to historic distribution, but local populations change dramatically from year to year. Population fluctuations appear to be correlated with natural flood events that create and destroy isolated pockets of habitat, but the dynamics are not well understood. It appears that these natural events have a greater influence on populations than management activities but natural flood events may be exacerbated by watershed conditions that increase sedimentation and scouring in the stream channel.

Information sources.

Arizona Game and Fish Department. 2001. *Gila ditaenia*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

USDI Fish and Wildlife Service. 1992. Recovery Plan for the Sonora chub (*Gila ditaenia*). US Fish and Wildlife Service, Region 2, Albuquerque NM. 50 pp.

Spikedace (*Meda fulgida*)

The Spikedace is a small stream-dwelling minnow listed in the Threatened and Endangered Species Group for the Forest Plan. It is currently listed as Threatened by USFWS and critical habitat is designated in Aravaipa Creek. It was noted that distributional studies were needed to determine the species' status on the Forest (USFS 1981). No populations are known from the CNF. No occupied habitat was listed in the Forest Plan (USFS 1986).

Population trends. Historically, the Spikedace was common and locally abundant throughout the upper Gila River basin in Arizona and New Mexico. It is currently restricted to less than six percent of its former range, occurring only in Aravaipa and Eagle Creeks, the upper Verde River and the upper Gila River in New Mexico (AGFD 2001). No monitoring for Spikedace occurs on the CNF.

Habitat Trends. The species was not selected as an indicator of a specific habitat type. Occupied habitats do not occur on the CNF.

Evaluation. There are no records that the Spikedace ever occurred on the CNF. For this reason, the species has no utility as a management indicator on the Forest.

Information Sources.

Arizona Game and Fish Department. 2001. *Meda fulgida.* Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

Revised and updated: 5-2002 (RAG)

LITERATURE CITED

Arizona Game and Fish. 1999. Wildlife 2006. Arizona Game and Fish Department. Phoenix, Arizona. 91pp.

Arizona Game and Fish Department. 2000. Black bear harvest data *in* Arizona game survey and harvest data summary. Federal Aid Project W-53-M-50. Arizona Game and Fish Department, Phoenix, AZ.

Arizona Game and Fish. 2001a. *Trogon elegans*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 5pp.

Arizona Game and Fish. 2001b. *Myiodynastes luteiventris*. Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Arizona Game and Fish. 2001c. *Asturina nitida maxima*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Arizona Game and Fish. 2001d. *Lampornis clemenciae*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona.

Arizona Game and Fish. 2001e. *Pachyramphus aplaiae*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Arizona Game and Fish. 2001f. *Tyrannus crassirostris*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Arizona Game and Fish. 2001g. *Camptostoma imberbe*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona.

Arizona Game and Fish. 2001h. *Empidonax fulvifrons pygmaeus*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Arizona Game and Fish. 2001i. *Vireo bellii*. Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Arizona Game and Fish. 2001j. *Ammodramus bairdii*. Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 3pp.

Arizona Game and Fish. 2001k. *Eleutherodactylus augusti cactorium.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 4pp.

Arizona Game and Fish. 2001l. *Hyla eximia.* Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Arizona Game and Fish. 2001m. *Abystoma tigrinum stebbinsi.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 5pp.

Arizona Game and Fish. 2001n. *Crotalus willardi willardii.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 4pp.

Arizona Game and Fish. 2001o. *Crotalus pricei.* Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Arizona Game and Fish. 2001p. *Poeciliopsis occidentalis occidentalis.* Unpublished abstract compiled and edited by the Heritage Data Management System. Arizona Game and Fish Department. Phoenix, Arizona. 5pp.

Arizona Game and Fish. 2001q. *Gila intermedia.* Arizona Heritage Data Base. Arizona Game and Fish Department. Phoenix, Arizona. Unpublished.

Arizona Game and Fish Department. 2001. *Campostoma ornatum.* Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

Arizona Game and fish Department. 2002. Mearns' quail wing barrel data. Unpublished memo from J. Heffelfinger to T. Supplee on file in Coronado National Forest Supervisor's office. Tucson, AZ.

Bishop, R.A., and C.R. Hungerford. 1965. Seasonal food selection of Arizona Mearns' quail. Journal of Wildlife Management 43:522-526.

Bowers, R. K., Jr., and J. B. Dunning, Jr. 1994. Buff-breasted flycatcher *Empidonax fulvifrons).* *In* The Birds of North America, No. 125 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Bristow, Kirby D. and Richard A. Ockenfels. 2000. Effects of human activity and habitat conditions on Mearn's quail populations. Arizona Game and Fish Department. Phoenix, Arizona. Research Branch Technical Guidance Bulletin No. 4 (August 2000). 27pp.

Brown, Bryan T. 1993. Bell's vireo. *In* The Birds of North America, No. 35 (A. Poole, P. Stettenheim, and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences: Washington D.C.: The American Ornithologists' Union.

Brown, D. E. 1989. Arizona Game Birds. The University of Arizona Press. Tucson.

Brown, Richard L. 1978. An ecological study of Mearns' quail. Arizona Game and Fish Department. Research Division. Federal Aid in Wildlife Restoration. Project W-78-R-22, Work Plan 2, Job 1. 26 pp.

Brown, R.L. 1982. Effects of livestock grazing on Mearns' quail in southeastern Arizona. Journal of Range Management 35:727-732.

Chase, Jameson Fales. 2001. Host and habitat partition by sympatric brood parasites in Arizona. PhD dissertation. Department of Environmental, Population, and Organismic Biology. University of Colorado. 162pp.

Committee of Scientists. 1999. Sustaining the People's Land. Recommendations for stewardship of the national forests and grasslands into the next century. US Dept. Agr., Washington, D.C. 181 pp.

Conway, C.J. and C. Kirkpatrick. 2001. Population status, detection probability and effects of fire on Buff-breasted flycatchers. Final Report. Arizona Game and Fish Department Heritage Fund Grant I99028. Arizona Cooperative Fish and Wildlife Research Unit. Tucson AZ. 60 pp.

Corman, T.E. and C. Wise-Gervaise. 2005. Arizona breeding Bird Atlas. Albuquerque: University of New Mexico Press.

Dagenhardt, William G. et al. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press. Albuquerque, New Mexico. 430pp.

Deeble, B. 1999. Rose-throated becard (*Pachyramphus aglaiae*): Species management abstract. The Nature Conservancy. Arlington VA. 6 pp.

Deeble, B. 2000. Bells vireo (Vireo bellii): Species management abstract. The Nature Conservancy. Arlington VA. 11 pp.

Devers, P.K. 1999. Public attitudes, wildlife and recreation management in Pusch Ridge Wilderness, Arizona. Masters thesis, University of Arizona, Tucson, AZ.

Edison, Judy et al. 1995. Davis and Russell's finding birds in southeast Arizona. Tucson Audubon Society. Tucson, Arizona. 347pp.

Garrison, Barbara A. and Janine A. Spencer. 1996. Arizona peregrine falcon 1995 reproductive survey results. Arizona Game and Fish Department. Phoenix, Arizona. Nongame Endangered Wildlife Program. Final Report. 43pp.

Glinski, Richard L. 1998. Gray hawk. Page 82-85 i*n* The Raptors of Arizona (R.L. Glinski, ed.). The University of Arizona Press. Tucson, Arizona.

Goldberg, Caren S. and Cecil R. Schwalbe. 2000. Population ecology of the barking frog. Arizona Game and Fish Department Heritage Fund IIPAM Project No. I98014. 50pp.

Gori, David F. 1993. Monitoring native fish populations on the Coronado National Forest and Nature Conservancy Preserves in Arizona. Report submitted to the Coronado National Forest in completion of CCS-3-91-05-014. The Arizona Nature Conservancy. Tucson, Arizona. Unpublished.

Hall, Linnea Suzanne. 1996. Habitat selection by the elegant trogon *(Trogon elegans)* at multiple scales. PhD Dissertation, University of Arizona. Tucson, Arizona. 181pp.

Harris, L.K. 1992. Recreation in mountain sheep habitat. Thesis, University of Arizona, Tucson, AZ.

Healy, Stuart. 2001. Raw bar graphs for Scheelite and Sawmill Canyons. http://www.aztrogon.com. 4pp.

Heffelfinger, James R. and Ronald J. Olding. 2000. Montezuma quail management in Arizona. Pages 183-190 *in* L.A. Brennan, W.E. Palmer, L.W. Burger, Jr., and T.L. Pruden (eds.). Quail IV: Proceedings of the Fourth National Quail Symposium. Tall Timbers Research Station, Tallahassee, FL.

Heffelfinger, J., B. Wakeling, J. Millican, S. Stone, T. Skinner, M. Fredlake and M. Adkins. 2000. Southeastern Arizona turkey management plan. Arizona Game and Fish Department. Phoenix AZ.

Hoffmeister, Donald F. 1986. Mammals of Arizona. The University of Arizona Press and the Arizona Game and Fish Department. Tucson, Arizona. 602pp.

Johnson, Terry B. 1983. Status report: *Crotalus willardi willardi* (Meek 1905). U.S. Fish and Wildlife Service, Office of Endangered Species. Contract No. 14-16-0002-81-224, Modification No. 3. Albuquerque, New Mexico. 70pp.

Kunzmann, M.R. et al. 1998. Elegant trogon *(Trogon elegans). In* The Birds of North America, No. 357 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, Pennsylvania. 24 pp.

Latta, Marjorie J., Carol JH. Beardmore, and Troy E. Corman. 1999. Arizona partners in flight. Bird conservation plan. Version 1.0. Arizona Game and Fish Department. Phoenix, Arizona. Nongame and Endangered Wildlife Program Technical Report 142. 331pp.

LeCount, A.L., R.H. Smith, and J.R. Wegge. 1984. Black bear habitat requirements in central Arizona. Ariz. Game and Fish Dept., Spec. Rep. No 14. Phoenix. 49pp.

Brown, D.E. 1989. Arizona game birds. University of Arizona Press and the Arizona Game and Fish Department. Tucson.

Lowther, Peter E. and Douglas F. Stotz. 1999. Sulphur-bellied flycatcher (*Myiodynastes luteiventris). In* The birds of North America, No. 475 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Martin, J. A. 1997. Distribution, abundance, and habitat characteristics of the buff-breasted flycatcher in Arizona. M.S. thesis, University of Arizona. Tucson, Arizona.

Morrison, M.L., R.W. Mannan, L.L. Christopherson, L.S. Hall, and J.A. Martin. 1996. Determining the status and trends of neotropical migrant bird populations in riparian vegetation in southeastern Arizona. Final Report. USFS-U of A Agreement No. CCS3-94-05-006. Tucson, Arizona.

National Audubon Society. 2002. Christmas bird counts, results and analysis. http://209.177.45.29/birds/cbc/hr/graph.htm.

Nielson, J.L., D. Wiltse and M. Fountain. 1999. Testing for rainbow trout introgression in Arizona Apache trout populations using microsatellites. Report submitted to Arizona Game and Fish. USGS/BRD Alaska Biolological Science Center. Anchorage. 24 pp.

Ockenfels, Richard A., Daniel E. Brooks, and Charles H. Lewis. 1991. General ecology of Coues white-tailed deer in the Santa Rita Mountains. A final report. Arizona Game and Fish Department. Phoenix, Arizona. Research Branch Technical Report No. 6. 73pp.

Phillips, A., J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press. Tucson, Arizona.

Schoenecker, K.A. 1997. Human disturbance in bighorn sheep habitat, Pusch Ridge Wilderness, Arizona. Thesis, University of Arizona, Tucson, AZ.

Scott, V.E., K.E. Evans, D.R. Patton, and C.P. Stone. 1977. Cavity nesting birds of North American forests. U.S. Dep. Agric. Handb. 511, 112p.

Sredl, Michael J. and J. Eric Wallace. 2000. Management of the amphibians of Fort Huachuca, Cochise County, Arizona. Arizona Game and Fish Department. Phoenix, Arizona. Department of Defense Contract DABT63-95-P-2237. Nongame and Endangered Wildlife Program. Technical Report 166. 34pp.

Stefferud, J.A. 2001. Redrock Canyon photopoint and aquatic habitat survey. Sierra Vista Ranger District, Coronado National Forest, Santa Cruz Co. USDA Forest Service, Tonto National Forest, Phoenix.

Stefferud, J.A. and S.E. Stefferud. 1995. Status of Gila topminnow and results of monitoring the fish community in Redrock Canyon, Coronado National Forest, 1979-1993. Pages 361-369 in L.F. DeBano, G.J. Gottfried, R.H. Hamre, C.B.Edminster, P.F. Ffolliott, and A. Ortega-Rubio, editors. Biodiversity and management of the Madrean Archipelago: the sky islands of southwestern United States and northwestern Mexico. September 19-23, 1994, Tucson, Arizona. USDA Forest Service, Gen. Tech. Rep. RM-GTR-264, Fort Collins, Colorado.

Stromberg, M.R. 1990. Habitat, movements and roost characteristics of Montezuma quail in southeastern Arizona. Condor 56:123-125.

Taylor, Richard Cachor. 1994. Trogons of the Arizona borderlands. Treasure Chest Publications. Tucson, Arizona.

Taylor, Richard Cachor. 1995a. A birder's guide to southeastern Arizona. American Birding Association, Inc. Colorado Springs, Colorado. 341pp.

Taylor, Richard Cachor. 1995b. Location checklist to the birds of the Huachuca Mountains and the upper San Pedro River. Borderland Productions. Tucson, Arizona. 48pp.

Tenney, C.R. 2000. Northern beardless-tyrannulet *(Camptostoma imberbe). In* The Birds of North America, No. 519. (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, Pennsylvania.

The Nature Conservancy. 2000. Species management abstract. Rose-throated becard *(Pachyramphus aglaiae).* The Nature Conservancy. Arlington, Virginia. 7pp.

USDA. Forest Service. 1981. Selection of management indicator species, Coronado National Forest land management planning. Report on file at Coronado National Forest. Tucson, Arizona. Unpublished.

USDA Forest Service. 1982. Wildlife and Fish. Pp 83-101 *in* Analysis of the management situation for the Coronado National Forest Plan. Unpublished report. Coronado National Forest. Tucson, AZ.

USDA Forest Service. 1986. Coronado Forest Plan. U.S. Forest Service, Southwestern Region. Albuquerque, New Mexico. 130pp. + Amendments.

USDA Forest Service. 1998. Biological assessment of on-going and long-term grazing on the Coronado National Forest. USDA Forest Service, Coronado National Forest, Tucson, Arizona.

USDA Forest Service. 2000. Allegheny National Forest final MIS monitoring report. Allegheny National Forest. Warren, PA.

USDI Fish and Wildlife Service. 1997. Endangered and threatened wildlife and plants; determination of endangered status for three wetland species found in southern Arizona and northern Sonora, Mexico. Federal Register 62(3):665-689.

USDI Fish and Wildlife Service. 1998. Biological opinion and conference opinion. Land and Resource Management Plans, as amended, for Eleven National Forests and National Grasslands in the Southwestern Region. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. File Designation Region 2/ES-SE. 130pp + Attachments.

USDI Fish and Wildlife Service. 1999. Biological opinion. On-going and long-term grazing on the Coronado National Forest. U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office. Phoenix, Arizona. File Designation AESO/SE 2-21-98-F-399. 376pp.

USDI Fish and Wildlife Service. 2003. Monitoring plan for the American peregrine falcon, a species recovered under the Endangered Species Act. U.S. Fish and Wildlife Service Divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region. Portland , OR. 53 pp.

USGS Patuxent Wildlife Research Center. 2002. The North American breeding bird survey internet data set, 8 February 2002 (http://www.mp2-pwrc.usgs.gov/bbs/retreival/).

Weedman, D.A. and K.L. Young. 1997. Status of Gila topminnow and desert pupfish in Arizona. Nongame and Endangered Wildlife Program Technical Report 118. Arizona Game and fish Department, Phoenix, Arizona.

Whetstone, Jack. 1995. Baird's sparrow winter habitat assessment on the grasslands of the Coronado National Forest. U.S. Department of Interior, Bureau of Land Management. Sierra Vista, Arizona. Unpublished.

Williamson, S.L. 2000. Blue-throated hummingbird *(Lampornis clemenciae). In* The Birds of North America, No. 531 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, Pennsylvania.

Young, P.J., V.L. Greer, J.E. Lowry, E. Bibles, N. Ferguson and E. Point. 2001. The Mount Graham Red Squirrel monitoring program: 1989-1998. The University of Arizona. Tucson, AZ.

Appendix 1.

Wildlife Monitoring requirements from the 1986 Coronado National Forest Plan, pages 93-94.

WILDLIFE

1.ITEM MONITORED:

A. population and habitat trends of management indicator species.

2. PURPOSE:

A.Federal and State Regulations.

B.Forest issue related.

3. MONITORING METHOD:

A. White-tailed deer - sex and age (NMGF, AGF using aerial, horse, and foot transects). Also hunter kill information.

B. Mearn's quail - Population trend date from hunter wing barrel returns.
C. Pronghorn - Sex and age ratios (AGF using aerial, horse and foot transacts. Also hunter kill information.

D. Merriam's turkey - hunter kill information.

E. Coppery-tailed trogon - sex and age ratios (Private cooperators and wildlife biologist using foot transacts).

F. Gila topminnow - Number of miles of occupied habitat (USFWS. AGF using foot transacts.)

G. Black bear-Recording sign, hunter kill information, depredation reports and campground problems.

H. Human effects on desert bighorn sheep - radio collar tracking (AGF) vegetation use (University of Arizona); population trend (AGF).

I. Other indicator species groups and - threatened and endangered species. Measurements of appropriate habitat components.

4.FREQUENCY:
Annually

5. EXPECTED PRECISION/RELIABILITY:
A.Birds - -10%/+ 80%

B.Other Came and Fish Data - Variable by species.

6. TIME FOR REPORTING:
Annually

7.COST:

A.White-tailed deer - $400 annually
B.Mearn's quail -$40 annually
C.Pronghorn - $16O annually
D.Merriam's turkey - $80 annually
E.Coppery-tailed trogon - $IOO annually
F.Gila topminnow - $160 annually
G.Black bear - $200 annually
H.Human effects on Bighorn sheep - $200 annually
1.Other indicator species groups and threatened and endangered species
$11,250 annually for first 5 years. then $ll,250 once every 10 years thereafter

8.EVALUATION:

The monitoring system includes Forest Service costs of management, analysis, and interpretation of the data obtained from monitoring. The proposal has an integrated system involving three levels of monitoring:

(1) Species-only (those management indicator species as required by law); (2) management guilds (guilds of birds in habitats especially vulnerable to change through human activities): and (3) habitats (most wildlife species would be monitored by inference from trends in habitats, based on knowledge of each species' habitat requirements).

It should be realized monitoring of wildlife resources on such a scale as proposed is at best tentative and exploratory. State-of-the art knowledge indicates it is a suitable system at the present time, but it must be noted that modifications may be needed within the planning period to better indicate the effects of National Forest management activities on the Coronado's wildlife resources.

Costs shown are Forest Service costs only. They reflect two needs: (1) State and responsible federal agencies would monitor species population within their authority. Costs given are for coordination by the Forest with these agencies. (2) Needed research represents the bulk of costs noted. Evaluation of these needs could be used for base data displays such as integrated stand management, habitat suitability index and wildlife and fish habitat relationships.